The Gazette Talks To Miami Vice's Jan Hammer

COMPUTE!'s GAZETTE

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May 1986
Issue 35, Vol. 4, No. 5
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FOR **COMMODORE** PERSONAL COMPUTER USERS

Computers And MIDI

Find out how MIDI can link you and your computer to a whole new world of music.

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A Guide To Commodore User Groups, Part 1

Horizons: A BASIC 7.0 Compiler Reviewed

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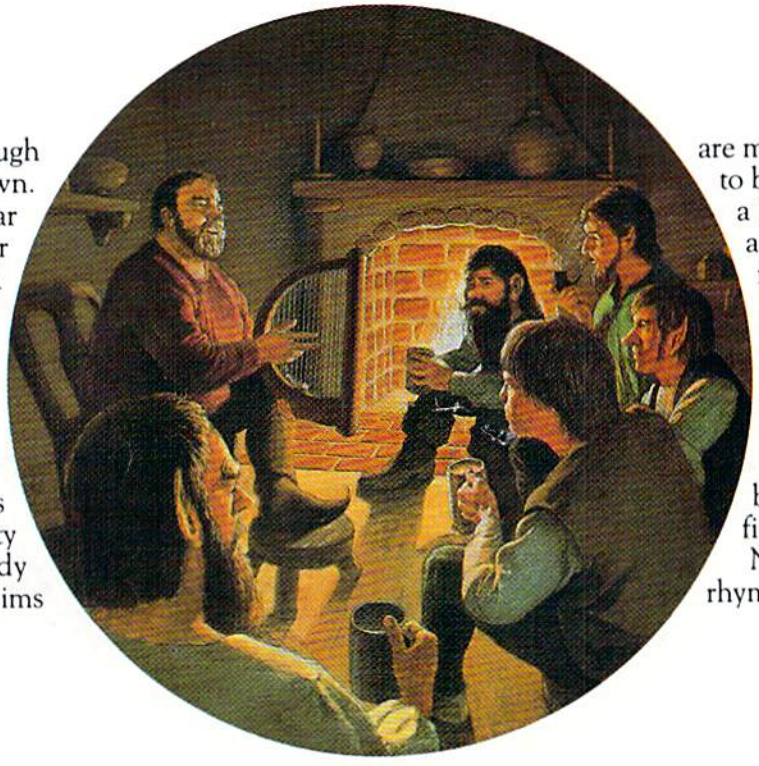
When the Going Gets Tough, the Bard Goes Drinking.



And the going is tough in Skara Brae town. The evil wizard Mangar has cast an eternal winter spell. Monsters control the streets and dungeons beneath. Good citizens fear for their lives. What's worse, there's only one tavern left that serves wine.

But the Bard knows no fear. With his trusty harp and a few rowdy minstrel songs he claims are magic, the Bard is ready to boogie. All he needs is a band of loyal followers: a light-fingered rogue to find secret doors, a couple of fighters to bash heads, a conjurer to create weird allies, a magician for magic armor.

Then it's off to combat, as soon as the Bard finishes one more verse. Now what's a word that rhymes with "dead ogre?"

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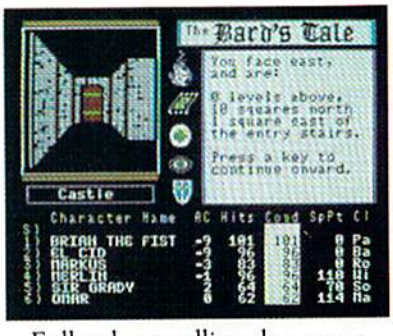

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Melodian will teach you to play, compose,

A True Breakthrough In Music Education

At last, a program that makes it not only easy but fun to learn music. The Melodian keyboard and software were designed by Harry Mendell who designs custom synthesizer electronics and software for professional musicians such as **Stevie Wonder** and Eric Himy, an award winning concert pianist. The Melodian boasts many of the professional features found only on more expensive equipment. These features include multitrack recording, the ability to create custom instrument sounds and most importantly, ease of use.

Start your lesson with **RhythmMaster** Software. With its built-in metronome, RhythmMaster will display the treble and bass musical staffs and a picture of a piano keyboard. RhythmMaster will then play a measure of music and you must try to play the same measure back on the Melodian keyboard. You're not familiar with the keyboard or can't read music? No problem. RhythmMaster displays the notes you are to play on the musical staff and on the keyboard pictured on the monitor. If you strike the wrong key the note on the musical staff turns red and shows you which key you played wrong, making it ever so easy to correct what you played.

If you should hold a key too long a turtle runs across the screen. Inversely if you should release a key too quickly a rabbit scurries by. If you don't play it correctly RhythmMaster knows it and repeats the measure for you to play.

ConcertMaster teaches you how to play 35 pre-recorded songs from Bach to Rock. With ConcertMaster you can analyze music note by note, instrument by instrument and learn how a music composition is put together. Then you can compose your own music and record it right onto your floppy disks.

There are nineteen different instrument sounds to choose from in over a seven octave range giving you a wide choice of instruments to suit your musical taste and expression. You can also create your own instrument sounds.

ScoreMaster enables you to print out your music in standard music notation for other musicians to play, or for yourself.

New York Times Says . . .

Erik Sandberg-Diment of the New York Times states "really useful and instructive item ... Tanya, our 10 year old beginner quickly caught the spirit of matching the dance of her fingers to the measured metronome." "One piece of educational software that, unlike most of its kinfolk, actually delivers. These software-hardware combinations offer a lot of entertainment to the Commodore owner."

RUN Magazine Says . . .

Tom Benford of RUN notes "Whenever a selection of products of the same genre is available, one among the bunch rises head and shoulders above the rest. Such is the case with Melodian ConcertMaster keyboard and software. The combined features of RhythmMaster and ConcertMaster give you a complete music tutorial."

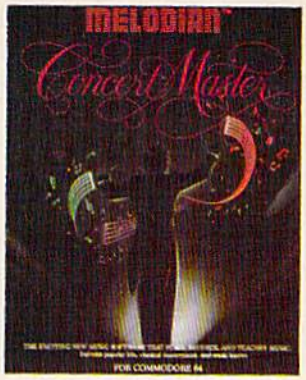
AHOY! Magazine Says . . .

Peggy Herrington of AHOY! said "The system is so easy to use that I didn't need the documentation". "It's fun, challenging, and educational, and for playability and ease of use it is nothing short of spectacular."

Satisfaction Guaranteed When You Buy Direct

By selling directly to you, we are able to give you the Melodian Keyboard and Software at far lower prices than ever offered before. You take no risk. **If the Melodian keyboard or any of the programs don't please you, for any reason whatsoever, send it back within 60 days for a full refund!**

and record music in just one evening!!



RhythmMaster Software rm-01 — $29.95

RhythmMaster teaches a beginner how to read music and play it correctly and in rhythm on the musical keyboard.

RhythmMaster will have you reading and playing musical notes in minutes with fun and excitement.

RhythmMaster Features:

Trumpet, organ, violin, and synthesizer instrument sounds. Built in metronome. Pause/Play control. Set-up menu for customizing RhythmMaster.

RhythmMaster Teaches:

How to read notes on the treble and bass musical staffs,the names of the notes, where the notes are on the keyboard how to play whole notes, half notes, quarter notes, eighth notes and sixteenth notes in combinations, in both 3/4 and 4/4 time. How to play in different tempos.

RhythmMaster Requires:

A Commodore 64 or Commodore 128 with disk drive. Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes.

Melodian Musical Keyboard kb-01 — $99.95

40 Keys (A-C) in professional gauge spring loaded to give the feel and response of a real keyboard instrument. Polyphonic.

Registers (with ConcertMaster)

Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertino, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 2, which can be played over a 7 octave range. Programmable sounds as well.

Recording (with ConcertMaster)

Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.

Interface

Built in interface for Commodore 64, Commodore 128, plugs right in to joystick port no. 2 and user port.

Power Supply

Powered direct by the computer, no batteries and cords required.

Finish

Table Model in white high-impact material, with carrying handle, protective key cover, and built in music stand. Size 29 -1/8 X 9-9/16 X 3-11/16, weighs 9 pounds.

Programmer's Tool Kit pt-01 — $29.95

Contains programs, and BASIC source listings for reading the Melodian Musical Keyboard, and for reading and creating music files for Melodian ConcertMaster.

ConcertMaster Software cm-01 — $29.95

ConcertMaster teaches how a composition is put together, note by note, instrument by instrument. You learn to play 35 pre-recorded songs from Bach to Rock. Then you can compose your own songs and record them right onto your floppy disk.

ConcertMaster Teaches:

Scales, Bass lines, Familiar Beginner Songs such as "Jingle Bells", Easy classical songs such as "Bach Minuet" and Ravel's "Bolero". Advanced classics like "A Midsummer's Night Dream" by Mendelssohn, Popular hits such as "Thriller".

Instruments Sounds

Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertina, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 22, which can be played over a 7octave range. Programmable sounds as well.

Recording Functions:

Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.
Each track can be set to one of seven different functions:

- **Monitor:** Lets you use a track to play music live, without recording it.
- **Record:** Records a track as you play.
- **Playback:** Lets you hear whatever has been recorded or loaded into the track. You may playback one track while recording another to build layers of instruments.
- **Mute:** Turns a track off. This is useful when you want to listen to or record one or two tracks at a time.
- **Save:** Stores a track to the disk.
- **Load:** Loads a track from the disk.
- **Protect:** Write protects a track.

Create New Instrument Sounds

Choose from pulse, sawtooth, triangle and noise sound sources. Control the sound envelope with attack, decay, sustain, and release times. Ring Modulation and Syncronization effects. Set Low pass, band pass, and high pass filter frequencies.

ConcertMaster Requires:

A Commodore 64 or Commodore 128 with disk drive. Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes.

Melodian ScoreMaster sm-01 — $29.95

With the ScoreMaster program your music can be printed out in music notation, which other musicians can read and play. Any music recorded with the ConcertMaster program can be printed by ScoreMaster.

ScoreMaster Requires:

A Commodore 64 or Commodore 128 with disk drive and printer compatible with the Commodore graphics mode such as the Commodore MPS 803, 1515, and 1525.
Melodian ConcertMaster program.

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking *quality* printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for hundreds more.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of scores of styles including double width and reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and . . . VOILA! The letter now fits on one page.

Special only $219.95

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4 to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, labels, anything you choose. Any size to 10" in width. In fact this unit is so advanced, it will load your paper automatically. Multiple copies? Absolutely! Use forms (up to 3 thick). Do you want to use spread sheets with many columns? Of course! Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" wide page, and you can do it quietly. The SP-1000 is rated at only 55 dB. This is quieter than any other impact dot matrix printer that we know of and is quieter than the average office background noise level.

Consistent Print Quality

Most printers have a ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade. To keep the printers output looking consistently dark, the ribbons must be changed quite often. The SP-1000 solves this problem by using a wide (½") ribbon cartridge that will print thousands of pages before needing replacement. (When you finally do wear out your ribbon, replacement cost is only $11.00. Order *#2001.)*

The Best Part

When shopping for a printer with this quality and these features, you could expect to pay much more. *Not now!* We sell this fantastic printer for **only $219.95! You need absolutely nothing else to start printing — just add paper (single sheet or fanfold tractor).**

No Risk Offer

We give you a 2-week satisfaction guarantee. If you are not completely satisfied for any reason we will promptly refund your purchase. The warranty has now been extended to 2 years. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours of receipt.

The Bottom Line

Be sure to specify the order # for the correct version printer designed for your computer.

Commodore C-64 & C-128, Order #2200, graphics interface & cable built in. $219.95

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We also have interfaces and cables for many other computers not listed. Call Customer Service at 805/987-2454 for details.

Shipping and insurance is $10.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air), APO or FPO is $22.00. Canada, Alaska, Mexico are $30.00 (air). Other foreign is $70.00 (air). California residents add 6% tax. The above are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks. Prices subject to change—CALL.

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COMPUTE!'s GAZETTE is published monthly by **COMPUTE!** Publications, Inc., 825 7th Avenue, New York, NY 10019 USA. Phone: (212) 265-8360. Editorial offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. POSTMASTER: Send address changes to *COMPUTE!'s GAZETTE*, P.O. Box 10957, Des Moines, IA 50340. Second class application pending at Greensboro, NC 27403 and additional mailing offices. Entire contents copyright ©1986 by **COMPUTE!** Publications, Inc. All rights reserved. ISSN 0737-3716.
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editor's notes

As the foremost applications magazine in the industry, it's extremely important to us to keep up with you, our readers. We occasionally do a feature called, "How Our Readers Use Their Computers." We'd like to repeat the feature in an upcoming COMPUTE's GAZETTE, with a few variations. Here's what we're interested in:

Send us a brief letter, or a postcard, detailing in just one or two paragraphs (let's say 25 to 50 words or so) the various ways in which you use your computer. Also let us know the model you have. We'll select a representative sample of your letters, ranging from the average to the unusual, and put together a feature article for early fall of this year. By submitting your paragraphs, we'll assume you're giving us permission to print your name and comments unless you specifically request that we not publish your name.

Please address your letter as follows:

Gazette Readers
P.O. Box 5406
Greensboro, NC 27403

While we're at it, let's get some more information from you. It's difficult sometimes from here to maintain the depth of perspective that we would wish. Thus the notion of many more of you than normal sitting down to write us a letter is challenging and exciting. If you have the time when you jot the above note, add another paragraph or two answering these three questions.

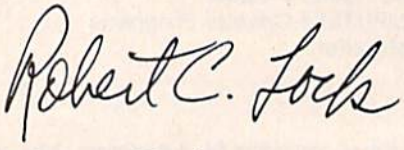
Over the last few years, literally millions of VIC-20 computers were manufactured and sold. Where are they? Are you continuing to use them for something? Or have they been relegated to the top of your closet? If you continue to use a VIC infrequently, or not at all, what have you replaced it with? Will you replace the replacement computer any time soon, and if so, with what?

Perhaps we'd better stop there. That's just our first question. You can see what we mean about getting excited over your answers to our questions. Oh, never mind. Here are the other two questions. While you're writing anyway, another paragraph or two won't be excessive. Right?

What three features/articles would you most like to see in GAZETTE during the next 12 months?

What are we not now doing that you would like us to start doing? (for example, sponsor a SIG; add bonus programs for disk subscribers; make provision for downloading from major online services, or whatever; fewer reviews; more reviews; the list could go on and we're sure it will).

In short, we'd like to hear from you, and if you'll help by focusing on these particular questions, we'd be most grateful. We promise to share the results with you in the months ahead.



Editor in Chief

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Run Magazine

". . . SWIFTCALC 128 has most of the features of Lotus 1-2-3."+
Ahoy Magazine
+And at less than half the price!

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All the computer tools you'll ever need to help manage your money on a day-to-day basis *and plan your financial future, too.*

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New York Post

SIDEWAYS

The ingeniously simple software program that rotates your spreadsheet by 90 degrees as it prints out and causes your hard copy to print out – you guessed it – *sideways.*

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New York Times

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". . . The good news starts as soon as you open the package. A toll-free customer hotline number is printed on the inside front cover of the documentation for each program. The support person I spoke with knew the systems and specializes in them exclusively."
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COMPUTE! Publications, Inc., publishes
COMPUTE! ***COMPUTE! Books*** ***COMPUTE!'s GAZETTE***
COMPUTE!'s GAZETTE Disk ***Apple Applications***

Editorial Office:
324 West Wendover Ave., Suite 200, Greensboro, NC 27408

Corporate Offices:
825 7th Avenue, New York, NY 10019

Customer Service:
P.O. Box 5038, F.D.R. Station, New York, NY 10150
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Office Hours: 8:30 AM to 4:30 PM Monday–Friday

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COMMODORE 64/128K

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403. We regret that due to the volume of mail received, we cannot respond individually to programming questions.

A Partial IF

One of the programs you published contains an IF statement with no equals sign: **IF A THEN PRINT A,B$,C,D: STOP**. Shouldn't there be a variable or expression for A to equal?

Eugene Guerin

There's no mistake in that line; it's the equivalent of ***IF A<>0 THEN PRINT A,B$,C,D: STOP****. In other words, if A is any value other than zero, then print the four variables and stop the program.*

You may be accustomed to IF-THEN statements that contain a complete expression like IF X=5 THEN Y=Y+Z. There's an intermediate step, though, one that you don't see. When BASIC comes to the IF, it evaluates the expression (in this example, the expression is X=5). It checks the value of the variable X against the number five. If it's true that X equals five, the computer executes the statement—or statements—after THEN. Otherwise it drops through to the next line.

The expression X=5 is either true or false. Within the computer, true expressions are assigned a value of −1, while false expressions are given a value of 0. You can test this by typing in the following line:

```
X=5: PRINT(X=5),(X=6)
```

If X is not equal to five, the ***IF X=5*** *evaluates to* ***IF 0*** *and since zero means "false," the statements following THEN are skipped. But if the variable X really holds a five, the first part of the line becomes* ***IF −1****. A zero always causes the IF to fail, any other value triggers the THEN. Try the following lines to see how this works:*

```
IF −5 THEN PRINT "−5 IS TRUE"
IF −1 THEN PRINT "−1 IS TRUE"
IF 0 THEN PRINT "ZERO WORKED"
IF .5 THEN PRINT ".5 IS TRUE"
```

Note that the message "ZERO WORKED" never prints. As far as IF is concerned, zeros are always false, and any other number is true.

The Designers' Signatures

Several months ago, we published some information about messages hidden in software. 128 owners who are curious about who worked on designing their computer can find out by entering ***SYS 32800,123,45,6****. Although this SYS has been mentioned in several user group newsletters and on bulletin boards, we're uncertain about who originally discovered it.*

Why Aren't Disks Preformatted?

I understand that I have to format a blank disk before using it. If commercial software can be sold on formatted disks, why can't blank disks be already formatted when you buy them?

Wendy Hsieh

In a world where all computers used compatible disk operating systems, preformatted disks would be a great convenience. However, almost every computer manufacturer uses a unique disk format—usually one that's incompatible with nearly every other brand. To sell formatted disks, a dealer would have to stock dozens of different types: one set of disks for the single-sided Commodore 1541, one for the double-sided 1571, another for IBM, at least two different formats for Apple, three different ones for Atari, and so on.

Disks containing commercial software must be formatted because it's impossible to put any data on an unformatted disk. Formatting establishes the tracks and sectors—the magnetic paths in which data is stored, as well as the map which tells the disk drive which of the available storage areas actually contain data. It's somewhat misleading to say that commercial software is sold on formatted disks—formatting isn't really an extra step in the process of preparing disks for commercial software, it's integral to storing the program on the disk. Many commercial software manufacturers take advantage of the formatting process to add special copy protection schemes. These are intentional "kinks" in the format that make it more difficult to copy the disk since most simple copy programs halt with error messages when a nonstandard disk format is detected.

You can walk into a computer store and buy a box of disks without having to wonder if they'll be compatible with your Commodore. To save time, some people format every disk in a box immediately after opening it. It takes a few minutes, but once it's done you don't have to bother with formatting and you never have to wonder if you've already formatted the disk.

Aligning Columns

For any future *SpeedScript* updates, I would suggest adding a tab key function, so columns of numbers could be lined up more easily. It's incredibly tedious to count spaces, and it's easy to get confused by the appearance of 60-column formatted data on a 40-column screen.

Jim King

Here's a suggestion for aligning columns in SpeedScript *and many other 40-column word processors. First type in a line that's mostly blank spaces, with periods where you want the columns to start. Press RETURN and then move to the beginning of the line. Press CTRL-E to erase the paragraph, which puts it into* SpeedScript's *erase buffer. Now press CTRL-R to recall the buffer several times—as many lines as you need. (With some word processors, you may have to define the line and then use a copy command).*

Now you've got a screen that's full of periods and spaces. Make sure you're not in insert mode—if the SpeedScript *command line is blue, press CTRL-I to go into overstrike mode. Tab to the beginning of a column (marked by a period) with the f1 key or the cursor-down key. Type the information for that column, press f1 again, and so on. Because of the word-wrap feature, the screen might not look right, but when it's printed out, the columns will be aligned. One more thing—if you make a mistake, don't use the delete key, because it pulls characters to the left. Instead, use the left-arrow key in the top left corner of the keyboard. It erases by replacing characters with spaces.*

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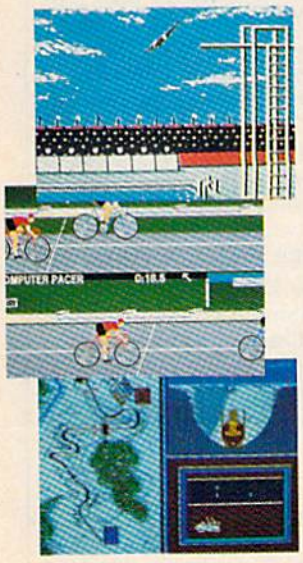

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Moving Proofreader Down A Line

My computer is connected to a TV and I can't see all of the characters on the top line. Usually it's not a problem, but checksums from the New Automatic Proofreader are not visible. Can you tell me how to move the two letters down to the next line?

Stephen Simon

All television sets have some degree of overscan, which means the picture is not displayed in its entirety. The edges are covered, the same way the edges of a painting might be covered by a frame. It's not disastrous if you don't see what's happening on the periphery of a television show, but it could be a problem if you couldn't see all of the screen. So, because of overscan, Commodore computers surround the main screen with a border area in which no text is printed.

Even with the additional border, some TV sets suffer from overscan severe enough to obscure portions of the screen. If you can't adjust the picture to include the top screen line, you can modify the program as follows:

In line 80, change 20570 to 20551.
In line 110, change 22054 to 22035.
In line 190, change 19 to 0.

Resave the program, using a different filename than you gave to the original version. These modifications move the checksum to just below the last line entered. This makes the Proofreader somewhat less convenient for listing and rechecking a group of existing program lines, so you probably won't want to make this change unless it's absolutely necessary.

Koala Doodle For The 128

I have written a program which may be useful to readers who own a 128 and a Koala Pad:

```
10 GRAPHIC 1,1: COLOR 1,2
20 X=POT(1): Y=POT(2)
30 DRAW 1,X,Y: GOTO 20
```

Plug the Koala Pad into port one of the 128. The POT commands are designed to read paddles, but they work on the Koala Pad as well.

Also, I have a question. I wrote the following program to check for positive and negative numbers, but it doesn't always work:

```
10 INPUT A: B=A*A: C=SQR(B)
20 IF A=C THEN PRINT "POSITIVE"
```

It doesn't print "POSITIVE" for some numbers like 3, 5, and 6. Why not?

Benjamin Burgess

Thanks for the doodling program, it's great fun for such a short program. It could provide the basis for a full-featured hi-res sketching program.

To answer your question: First, your computer doesn't make calculations in decimal (base ten). Numbers have to be converted into floating-point binary numbers before BASIC can perform mathematical operations. Then the result has to be translated back to base ten before it's printed. Slight, almost insignificant, inaccuracies can be introduced in this conversion process. To make things worse, the SQR function operates through logarithms, which can exacerbate the inaccuracies. Try entering PRINT SQR(2601), which should be 51, but turns out to be slightly off.

If you PRINT SQR(9), the computer says the answer is 3. Now try this: IF SQR(9)=3 THEN PRINT "THEY'RE EQUAL". The number 9 is converted to floating-point format, the square root (half of the logarithm) is calculated, and the resulting 3 is slightly different from a normal 3. The difference is so small that it doesn't show up when you print the square root of nine, only when you check to see if it's equal to three.

Not only is the SQR function relatively slow compared to other operations, it's not suitably accurate for finding out which numbers are positive. To see if a number is positive, it's faster to use a line such as IF A>0 or to use the SGN function, which tells you the sign of a number—positive, zero, or negative.

Cleaning Up After A Program Listing

When I finish typing a program, I find it much easier to check for errors by having my Gemini print it out. I use these lines:

```
OPEN 1,4
CMD 1: LIST
```

My printer wakes up and quickly lists the program. My problem is that the only way I can regain control of my computer is to type READY after **CLOSE 1,4**. The Gemini prints OUT OF DATA ERROR and I get the READY prompt back on the monitor. I thought the CLOSE statement was supposed to return output from the printer to the screen automatically. Both of my 64s do the same thing. What's wrong?

Joann Emerson

You're using the first three commands correctly, but before you close the channel to the printer, you need to send a blank line. The OPEN command tells the computer to open channel number one to the printer, which is device four. CMD causes all output to go to the previously opened channel. As a result, when you LIST the program, the listing is transferred to the printer instead of the screen. When you type READY, it's interpreted as a READ command. If there are no DATA statements, an error occurs and the CMD is cancelled. But that's not the best method for regaining control of your 64.

*When the printer is finished, you should enter **PRINT #1: CLOSE 1**. (Note that you include only the channel number—you don't have to CLOSE 1,4). The extra PRINT# is important because there may be a few characters remaining in the printer buffer.*

Unlike a typewriter, which prints characters one at a time as the keys are pressed, a printer doesn't usually print a character immediately after receiving it. Printers stash the characters in a buffer (a small area of memory in the printer, enough to hold at least one line of 80 or more characters). Two events can trigger characters in the buffer to be printed to paper—when the buffer fills up or when an end-of-line character (a carriage return) is received.

A misunderstanding may arise when the computer transmits the final line of the program listing. Your 64 knows that it's done, that it listed the whole program. But the printer may still have some characters in the buffer. It's waiting for more instructions. The PRINT#1 command sends a carriage return that forces the final line to print and returns output to the screen. You can then type CLOSE 1.

Listing Tricks

One of your articles said that putting a SHIFT-L after a REM prevents the computer from listing past that line. Is there any way to make the screen clear and print a message when someone tries to list a program?

Monte Ohrt

Try this: Enter a low line number and REM. Press SHIFT-2 twice and delete the second quotation mark (only one quotation mark is needed, but you don't want to be in quote mode). Now press CTRL-9 to turn on reverse mode, followed by SHIFT-M and SHIFT-S. You should see a reverse backslash and a reverse heart. You can now turn off reverse mode with CTRL-0 and enter the message you want printed at the top of the screen. Whenever you list the program, this line will clear the screen and print your message.

Use The Wedge Within A Program

When using the DOS Wedge (from the 1541 Test/Demo Disk), you can type @$ to see the directory. The program in memory remains intact. But the @$ command doesn't work inside a program, and causes a syntax error. Can you help?

Steve Nixon

For some reason, you have to put the dollar sign inside quotation marks. Within a program, use @"$" to list the directory.

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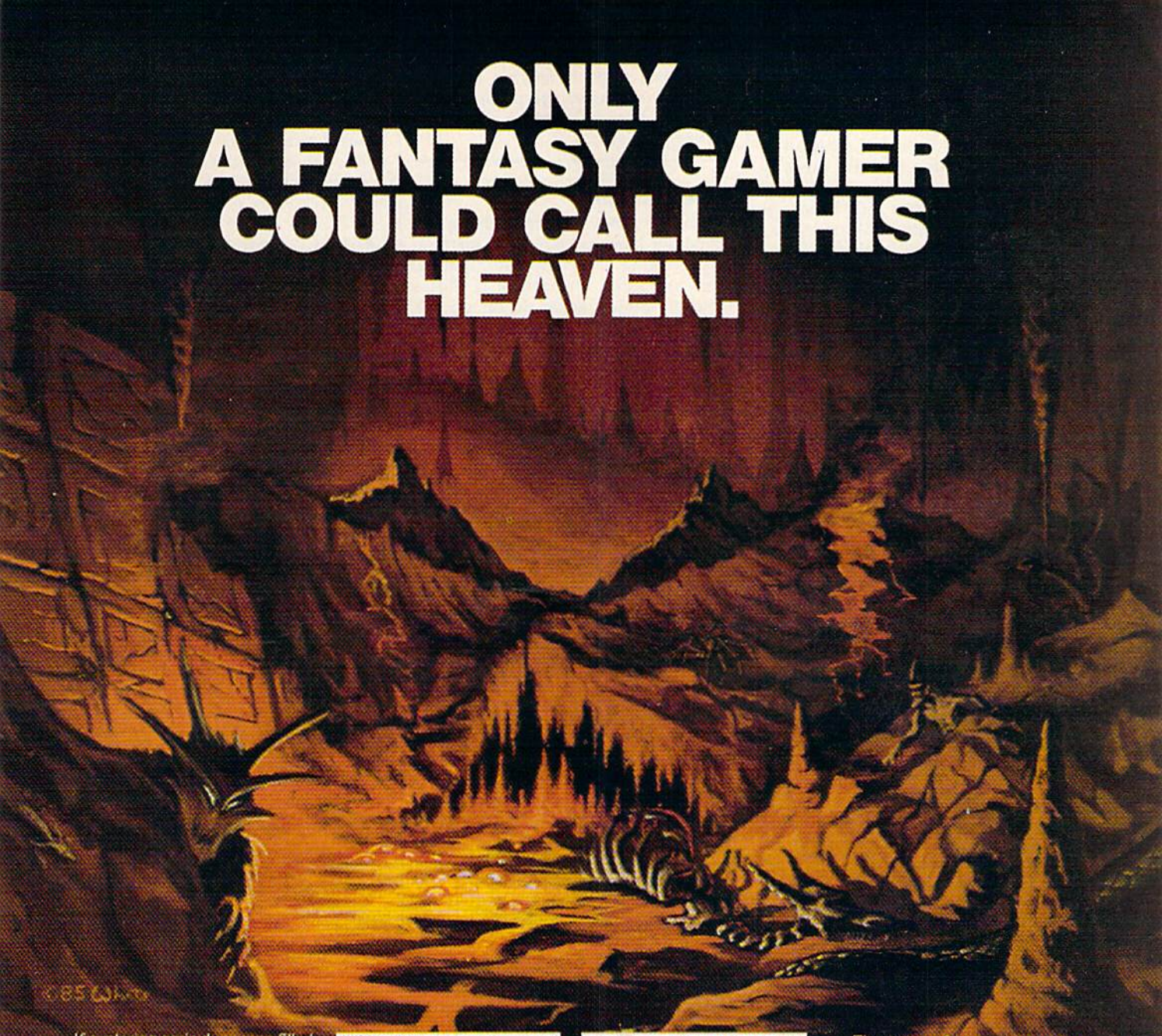

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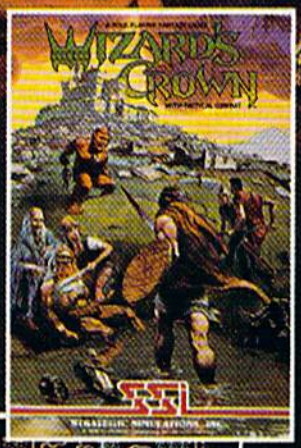

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Modem Shortcuts

I've just started to access CompuServe and other services with my 64 and modem. I expect to be making fairly frequent use of them and am already looking for ways to save time. For one thing, I'm looking for a 1200-baud modem for faster communications. But I find much of my time is taken up wading through menus, supplying commands. I could save a lot of time if I could enter the responses to prompts *before* signing onto a service. Do you know of any terminal programs with this capability?

John Godfrey

Although menus are helpful when you're new to telecommunications or when you just want to explore the system, they can get in the way when you know exactly where you want to go. To reach CompuServe's TPUG-sponsored Commodore Special Interest Group (SIG), for example, you have to make your way through several levels of menus.

But you should only have to work through the menus one time. When you find an area you like, make a note of the CompuServe page number in the top right corner. The TPUG area, for example, is called PCS-116. The next time you log on, enter GO PCS-116 at the exclamation point (!) prompt. You'll bypass all the menus and go directly to the Commodore SIG. Another option is to go to CompuServe's User Information area (the first choice on the main menu when you first sign on) and customize your log-on procedure. You can set things up so that when you enter the system, you're sent directly to a specified section, whether it's PCS-116, the CB simulator, or any other area. You can also create your own custom menu with up to ten different choices.

Many local bulletin boards have a similar option. Most have an "expert user" command that turns off the list of available commands, so you don't have to see the menu of choices every time you log on.

To make things even easier, many terminal programs allow you to redefine some keys as macros. *You might set up the f1 key to print GO PCS-116, for example. After logging on, you would just press f1 to go to the SIG.*

Another helpful feature available in some terminal programs is an automatic log-on file. Such a file contains the phone number, ID, and passwords to reach a bulletin board or information service. The terminal program uses this information to dial the number, wait for a connection, send the ID and password, and so on. We know of one person who sets up his computer and modem before going to sleep. At 4:00 a.m., when there's not much traffic on the system, the computer automatically dials CompuServe, downloads electronic mail that might be waiting, signs off, hangs up the phone, and prints out the messages. When he wakes up, the mail is waiting for him.

Indented Listings

One of the subjects we're studying in a Computer Literacy course is structured programming. The computers at school allow indented formatting of loops, which I would like to do on my 64. However, additional spaces placed between the line number and the instruction are eliminated when the program is listed. How can I keep the spaces in? I assume they would take extra memory, but I'm not initially concerned with this.

Geoff Chittenden

Programmers who like to indent lines on a 64 or other Commodores commonly employ two techniques.

The first is to place a single SHIFT-SPACE, SHIFT-J, or almost any other shifted character immediately after the line number, followed by one or more regular spaces. The shifted character is removed from the line, but the spaces remain. A minor drawback of this technique (apart from the extra memory it takes) is that if you should press RETURN over an indented line, the spaces are removed. Thus, whenever you change an indented line, it's necessary to go to the beginning of the line and type both INSerT and a shifted letter.

The second method is to put a colon (:) at the beginning of a line. You can then add as many spaces as you like and they won't be affected by later changes to the line.

Duplicate Program Names

After entering a program from your magazine, I discovered a few typing mistakes. I corrected them and attempted to resave the program, but the red light on the 1541 started flashing. The next time I loaded the program, the error messages return as if I hadn't changed the program. What am I doing wrong?

Connie Payne

The error in the program returned because you really hadn't *changed the program—at least not the program stored on disk. A blinking red error light on the 1541 (or a blinking green light on the 1571) is a signal to you that the operation you were attempting was not completed successfully. The fact that it was blinking after you tried to save means that your corrected version was not saved. Whenever you see the error light blinking, you need to figure out what caused the problem before proceeding with any further disk operations.*

Most likely, you tried to save the program under the same name you used when you saved it originally. Every program on a disk must have a unique name; if duplicate names were allowed it would be impossible to tell which program was which in the directory. The most obvious solution to the duplicate name problem is to simply use a different name when you save a corrected program. Commodore 128, Plus/4, and 16 owners can use the CATALOG command to check the disk directory and see which names have been used already. It's more difficult on the VIC and 64: Loading the directory erases the program you're trying to save, unless you're using a utility like "MetaBASIC" or the "DOS Wedge," both of which allow you to view the directory without actually loading it.

If you want to save a new version of a program and get rid of the old one, the best procedure is to first delete (scratch) the old file, then save the revised version. To scratch the old file, enter this line:

OPEN 1,8,15,"S0:*filename*":CLOSE 1

The first number (1 in this example) can be any value you choose; whatever number you use should match the number following the CLOSE statement. The second number is the device number for the drive (usually 8, unless you have more than one drive). The third number must be 15, the command channel *for the drive. Commodore 128, Plus/4, and 16 owners can also use the simpler built-in command:*

SCRATCH "*filename*"

After scratching the old version of the program, you can save the revised version under the same name.

The 1541 and 1571 drives do have a "save-with-replace" feature that performs this scratch-and-save process automatically, but we advise against using it. A bug in save-with-replace sometimes causes programs saved in this manner to be scrambled. (For more information on this problem—and how to avoid it—see "Save-with-Replace: Debugged at Last" in the October and November 1985 issues of COMPUTE!.*) For the curious, Save-with-Replace simply adds an @ symbol to the normal SAVE syntax:*

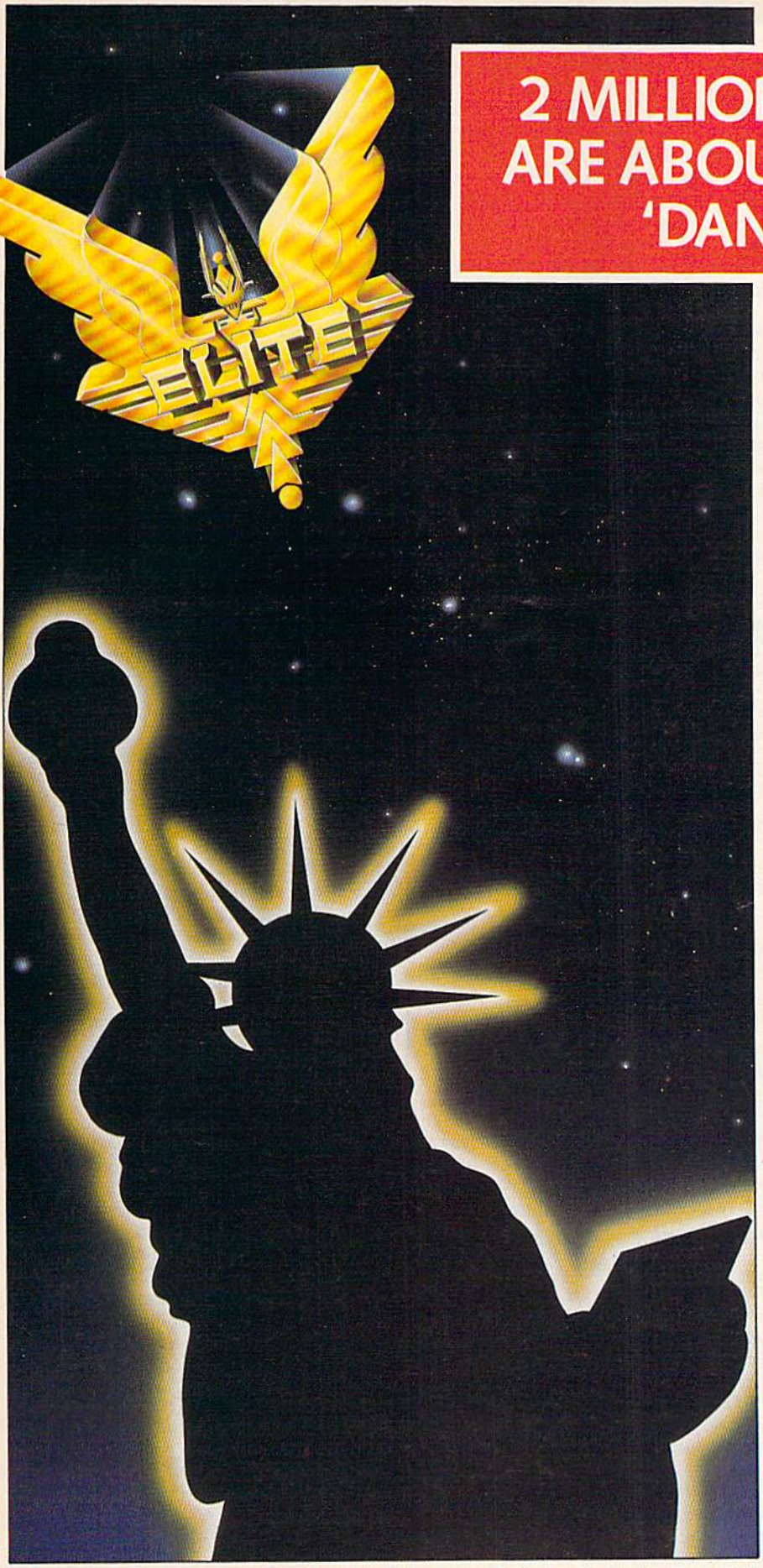
SAVE "@0:*filename*",8
DSAVE "@*filename*"

If you do choose to use save-with-replace, you should always reset the drive before you save, either by turning the drive off and back on, or by sending the reset command:

OPEN 1,8,15,"UJ"
CLOSE 1

The drive needs a brief moment to reset, so the CLOSE should be on a separate line. If you send this command from program mode, insert a delay loop (or use SLEEP 1 if you have a 128).

Finding out what caused a disk problem is a simple matter on the 128, Plus/4, and 16: Just **PRINT DS$** *to see the disk error number and message. You can get*



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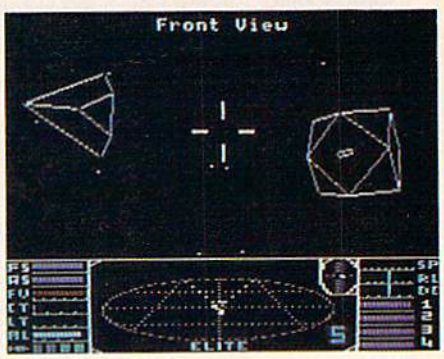

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the same information on a VIC or 64, but it takes a bit more work. You must read the error number and error message from the drive's command channel. Enter and run the following one-line program (or add it to the program in memory):

```
1 OPEN 15,8,15:INPUT#15,ER,ER$
  :CLOSE 15:PRINT ER;ER$:END
```

You must enter this as a program rather than simply as an immediate mode command because INPUT# works only in program mode. For your save problem, you'd be likely to see 63 FILE EXISTS, meaning there's already a file with the name you supplied. Another possibility is 74 DRIVE NOT READY, meaning that you have no disk in the drive, that the disk in the drive is not formatted, or that the drive door is not closed. Refer to your disk drive manual for explanations of other error numbers and messages.

80 Columns On A Television

Here's a hint for 128 owners who don't own a monitor but want to use the 80-column screen. If you own a video cassette recorder (VCR), you can get 80 columns on your television. First, you need the right type of monochrome 80-column cable, available commercially for about $10.

Insert the 9-pin plug into the 128's RGBI port and plug the RCA jack into the Video In port on your VCR. The VCR takes the composite video signal and converts it to a TV-compatible signal. The display is obviously not as good as a monitor, but it's readable. This method doesn't work very well with a color TV, but I'm using a black and white TV, which provides an acceptable display.

John W. Marrow

Thanks for the information. This technique works nicely. Also, you can build your own cable—see "Storage and Display: Using Peripherals with the 128" in last month's issue.

Combining Sprites With Hi-Res

I'm trying to write an arcade game for the 64 using both sprites and hi-res graphics. The sprites, which are stored at location 12288, always turn to garbage. Can you help?

John Lefebyne

Although memory locations 12288–16383 are usually a convenient area for storing sprite shapes, you can't put sprites there at the same time a hi-res screen is active, because of the way graphics are handled on the 64. Either you'll have the sprite shapes and the hi-res screen in two separate video banks (which is not allowed), or they'll be in the same video bank with the sprite definitions conflicting with the hi-res screen memory.

The VIC-II video chip of the Commodore 64 is responsible for displaying all graphics—text, hi-res, and sprites. It can address only 16K of memory at one time, however, which means that all video information, including sprite definitions and the hi-res bitmap, must be in the same 16K of memory. Since the 64 contains 64K of memory, you can select one of four different 16K video banks. When you first turn on a 64, the default video bank is number 0 (memory locations 0–16383).

The hi-res screen must begin on an even 8K boundary, which means that within the default video bank there are two places it can go; either at 0–7999 (not very useful—a lot of important information like zero-page pointers and the stack is stored in this area), or locations 8192–16191. So if you leave the VIC-II in bank 0, the only choice is to put the hi-res screen at 8192–16191. Unfortunately, this makes 12288 unavailable for sprite definitions.

There are two solutions to this problem. One is to put your sprites and character definitions lower in memory. The following table shows which locations are available:

704–767	*can hold one sprite definition.*
832–959	*can hold two sprite definitions (shapes will be scrambled if you access the Datassette).*
1024–2047	*screen memory (or color memory of hi-res bitmap screen).*
2048–4095	*available for up to 32 sprite definitions or custom characters.*
4096–8191	*used for ROM shadow of character set, unavailable for hi-res or sprites.*
8192–16383	*can be used either for bitmap screen or for character and sprite definitions.*

As you can see, there is plenty of room available for character and sprite definitions when the hi-res screen is at location 8192. But BASIC programs also reside in this area, beginning at 2048. To protect sprite definitions, custom characters, and the hi-res screen from BASIC and vice versa; raise the start of BASIC to 16384 with the following line:

```
POKE 44,64:POKE 64*256,0:NEW
```

This must be entered before you begin typing in or loading a program.

A second way to solve the memory conflict is to move all video information (screen memory, character definitions, sprites, and hi-res) to another bank and POKE to 56576 to redirect the VIC-II chip to the new video bank. For a brief explanation of how to switch video banks, see "Creating Hi-Res Graphics on the 64" (August 1985). More detailed information and examples can be found in Mapping the Commodore 64 *and* COMPUTE!'s Reference Guide to Commodore 64 Graphics.

TurboDisk And The 1571

I read in either COMPUTE! or COMPUTE!'s GAZETTE that initial tests of the 1571 showed that the "TurboDisk" program (July '85 GAZETTE) would not run. Has this been tried with production models?

Phil Combs

*We recently tested "TurboDisk" on a 128 (in 64 mode) and a 1571 disk drive. At first, the program didn't work properly and the computer locked up. But after sending the command which makes the 1571 act like a 1541—**OPEN 15,8,15, "U0>M0"**—TurboDisk worked fine.*

No Modem For CP/M Mode?

There is a severe problem with CP/M on the Commodore 128. The RS-232 port cannot be accessed from within CP/M and this means, of course, that no terminal program can be used. Considering the severity of this bug, I am surprised that I have seen nothing in print about it. Could you get to the bottom of this?

Courtney Harrington

It's true that the first releases of CP/M did not support telecommunications. But this is not a bug in the hardware, it was simply a feature omitted from the original CP/M disk. Commodore presumably decided to release the 128 without CP/M telecommunications rather than delay shipping the machine.

The advantage of a disk-based operating system like CP/M is that it's quite easy to revise and update. When you boot the CP/M disk, if you see a date of June or August 1985, you've got one of the early versions. There's a new CP/M disk that does support telecommunications (the version we have here at COMPUTE! Publications is dated December 6).

Where's The Software?

I've had a question I've wanted to ask for years, but always thought someone else would ask it and I would see the answer in the GAZETTE. The question is, where do you find CP/M software? I have a CP/M cartridge for my 64 and I've looked for software in every computer store, but never found anything for CP/M. Now the 128 is available, and it has a CP/M mode. Maybe a better question is, what good is the 128's CP/M mode if you can't find software for it?

Alan Vocelka

Start by looking in a local bookstore for books about CP/M. Chances are you'll find a book or two with an index listing software companies, RCPM bulletin boards, or CP/M user groups, which you can call or write to. If you have a modem, CompuServe has a variety of interest

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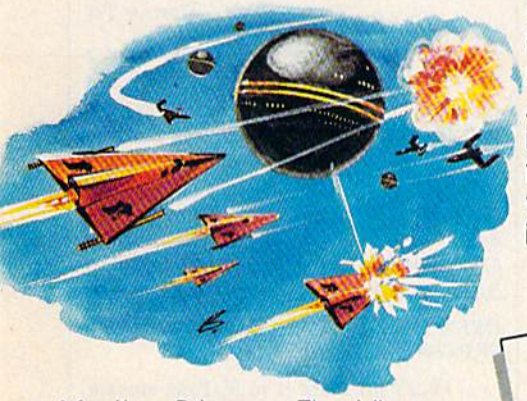

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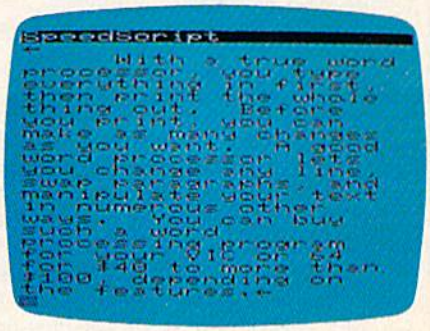

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groups for CP/M, with many programs that can be downloaded. Check the yellow pages under computer dealers and call stores that carry KayPro, Heath/Zenith, Epson, or other CP/M computers. Ask them if they know of any CP/M user groups or bulletin boards in the area. You could also contact Poseidon Electronics (103 Waverley Place, New York, NY 10011, 212-777-9515). Include a dollar bill for shipping/handling and a self-addressed envelope with two stamps if you want a catalog. They have several dozen disks for sale for both CP/M 2.2 (on the 64) and CP/M 3.0 (on the 128).

Also, you might want to check out "All About CP/M on the 128," an article in last month's issue which discusses several commercial CP/M packages. The following letter will also be of interest.

Support For CP/M

Commodore 128 users who are new to CP/M may wish to seek out a local CP/M users group for information about public domain software that will run on the 128. It might be a good idea to look for an Osborne users group: Unlike many CP/M users, Osborne owners include a number of users of CP/M+ (also know as CP/M-Plus or CP/M 3.0), the version of the operating system found in the 128. Commodore 128 users may find kindred spirits among Osborne users.

It should be noted that the 128 reads only Osborne double-density (DD) disks as "native" format. Watch out for Osborne single-density (SD) disks, the 128 won't read them. If you should happen to get such a disk, check in with a local Osborne group where you'll undoubtedly find a friendly soul who will move the program to DD format.

A good source of information is the First Osborne Group (FOG), Box 3474, Daly City, CA 94015, of which our local group is an affiliated member. Contact them for information on local FOG chapters. Those in the Chicago area should drop us a note: Chicago's First Osborne Group, Box 1768, Chicago, IL 60690. Or call our 24-hour remote CP/M (RCPM) bulletin board at 312-344-2505. A portion of the system, with downloadable files, is open to the public, as is the message system.

Benjamin H. Cohen,
CFOG President

Many 64 owners who upgraded to the 128 have said they're comfortable with the two Commodore modes, but feel puzzled and baffled by the CP/M operating system. Thanks for the information and expression of support. We've called the CFOG bulletin board (using the CP/M terminal program called MEX) and the sysop left a message that CFOG would soon be starting a new interest group devoted to CP/M on the 128.

Tab Stops And Separators

I'm writing a program that asks for musical notes to be input and then plays a tune. I wanted to add an option to save the data to disk, so you could recall the song and play it back later. The save routine seems to work, but when the data is read back it's different and the program never works. I have enclosed a program listing.

Stephen Setser

There are two bugs in your program, one in the save routine and one in the load routine. We'll begin with the save routine, which writes the musical data to a disk file in the following line (which is within a FOR-NEXT loop):

```
150 PRINT#3,A(J),T(J)
```

The commas in the line have two completely different functions. The first comma, after PRINT#3, is necessary; it separates the PRINT# command from the variable to be written to disk. The second comma, though, causes a problem. You can see what will happen if you enter the following line in direct mode: PRINT "ABC","DEF". Within a PRINT statement, a comma causes the cursor to skip ahead to the next column, much like the tab key on a typewriter. Within a PRINT# command, a comma performs a similar function, adding several spaces between items in a file. Change line 150 to fix the routine that writes the file:

```
150 PRINT#3,A(J): PRINT#3,T(J)
```

Each variable written to disk will be followed by a RETURN, the control code CHR$(13). In a moment we'll see why the character 13 is important. If you wanted the variables to be written one after another, you would add a semicolon directly after the variable—PRINT#3,A(J); for example.

In your program, the routine that reads the file has a loop containing the following line:

```
140 GET#3,A(J),T(J)
```

In this case, the commas are fine. You can GET# or INPUT# multiple items from a data file by separating the variable names with commas. The problem is that you're using GET# where you should be using INPUT#.

The way you wrote the program, one of the values for variable A(J) might be 755. When that number is written to the file, it takes up four bytes on the disk, plus one more for the RETURN character. If you looked at the file, you would find a space character (ASCII 32), the "7" character (ASCII 55), and two "5" characters (ASCII 53).

GET# reads a single character, so the first time through the loop, A(J) is given the CHR$(32) which ends up being a value of 0, and T(J) gets a CHR$(55) for a value of 7. The next time through the GET# loop, both variables receive values of 5. You wrote a 755 to the file, but reading resulted in the four separate numbers 0, 7, 5, and 5. If you change the GET# to INPUT#, everything will work correctly. INPUT# reads a series of characters and doesn't stop until it finds a CHR$(13), the RETURN character.

An Unwanted Answering Service

I recently purchased Commodore's new 1200 baud modem (model 1670) and am having difficulty with it. Every time the phone rings when the 64 is on, the modem automatically answers and sends a carrier. I could unplug the modem to prevent this, but that's irritating. Please help.

Danny Tai

It would certainly be annoying to have a friend call you only to hear the shrieking of a modem trying to make a connection. Fortunately, there's a simple way to solve the problem. Several telecommunications services have held online conferences about the 128. At one of these conferences held a few months ago, an expert from Commodore answered that question. From BASIC, enter the following line:

```
OPEN 2,2,2,CHR$(6)+CHR$(0)
PRINT#2,"ATS0=0": CLOSE2
```

That's all there is to it. Your modem will stop answering the phone for you. The Commodore representative also hinted that future versions of the 1670 will have a switch to disable the auto-answer feature.

PlayNet Is Online

Based on information received from representatives of the PlayNet telecommunications service prior to publication of the article "What's New Online for Commodore" (March 1986), we omitted PlayNet from the material presented. Since the story appeared, we've learned that PlayNet, while undergoing some internal reorganization, remains online. Our article deadline happened to coincide with the changes at PlayNet, resulting in the omission. We wish to assure readers that the service can be reached at the following address: PlayNet, 200 Jordan Road, Troy, NY 12180. Phone: 1-800-PLAYNET.

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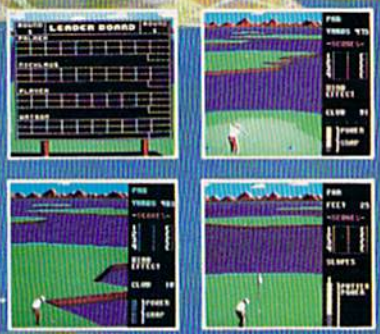

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Photo by Peter Hujar

Computer user Michael Riesman, conductor and keyboardist for the Philip Glass Ensemble.

"It's possible to create a fully orchestrated piece of music at home."
—Michael Riesman

MUSICIANS MEET COMPUTERS

Selby Bateman, Features Editor

All forms of contemporary music—television themes, film scores, Top 40 albums, pop/rock concerts, and even classical performances—are increasingly being influenced by sophisticated digital instruments and new computers and software. For professional musicians, the impact can be both liberating and threatening. Whatever the reaction, it's clear that the world of music will never be the same.

The landscape of professional music has been undergoing tremendous changes during the past few years:

• Digital synthesizers bring us musical sounds never before created; and at the same time stretch, transpose, bend, rotate, and mix more familiar sounds in ways totally unimaginable to earlier musicians.

• Sound-sampling machines capture, digitize, and recreate virtually any sound, from the chirp of a bird to the roar of a freight train, with amazing fidelity.

• A new generation of computers and computer software provides professional-quality composition and performance tools at low prices, and in forms accessible even to amateur musicians.

• And MIDI, the Musical Instrument Digital Interface, links all of these instruments, mixing and enhancing their capabilities, and providing musicians with unparalleled control and an often bewildering array of new options.

So swift has the new technology arrived, that composers and performers are experiencing much the same "future shock" that has engulfed the personal computer industry during the past half-dozen years.

But perhaps the most important result, for amateurs and professionals alike, is how this new technology allows the musician to enjoy professional studio capabilities in his or her own home with the performance power of an entire orchestra—and then some.

"The trend—the latest hot thing—seems to be geared toward home recording," says Ron Bienstock, a professional musician, film soundtrack composer, and former publisher/editor of *International Musician and Recording World* magazine.

"That explosion is probably the biggest development for musicians in the last ten years, beginning with the first home multitrack units. Musicians can now compose, can create, more readily at home than they did before," he says.

Commodore computer owners won't be surprised to learn that, for many musicians, their first exposure to a computer was the Commodore 64. Although Bienstock doesn't own a 64, he's used it professionally in film soundtrack development. "A Commodore 64, with the correct composing program, gives me the ability to sequence and edit without using a tape and razor blade, the old-fashioned way. I can just punch in my parts, get my 17 seconds of this theme, and sequence the entire matter. And MIDI into the computer makes it that much easier."

A popular music magazine recently polled its readers and found that half of them had computers, and half of those had Commodore 64s.

Another professional musician who has used the Commodore 64 in serious compositional work is Michael Riesman, conductor and keyboardist for the internationally acclaimed Philip Glass Ensemble. Under the direction of the respected avant-garde composer Philip Glass, the group has performed the score for such movies as *Koyaanisqatsi* and *Breathless*, in addition to collaborations with leading choreographers, opera directors, and rock and pop stars like David Bowie, Paul Simon, David Byrne, and others. The Ensemble has been among the first groups to continually explore the possibilities of electronic music, including computers.

Riesman recently bought an Apple Macintosh, and is using it with *Total Music*, a sequencer and music notation package from Southworth Music Systems. Although he's worked with synthesizers and sound sampling machines—Fairlights and Synclaviers—costing tens of thousands of dollars, Riesman feels that his new setup comes close to achieving what he can do with those units.

"I usually work from a structure, but I improvise a lot of keyboard parts. With this system, I'm hoping that I'm essentially going to be able to make records at home—do all of my parts at home with the flexibility of time and inspiration. Just sit down and play something, then have the opportunity to manipulate it, change the sound, that kind of thing. Whereas in the past, I've always been locked into improvisation on tape, and that's it—either you redo it, or you leave it," he says.

Recently, a popular music magazine polled its readers to find out their interest in computers. The results, Riesman notes, showed that professional and amateur musicians are very much aware of the powers of computers and their capabilities when hooked to other electronic instruments.

"Something like half of the readership had computers," says Riesman, "and half of those had Commodore 64s. And of the other half who didn't have computers, half were planning to buy one."

This enthusiasm is already having a spillover effect in a variety of ways, he adds. "I think the big change is for composer-performers who are going to be able to create music and get it out to the public without making a tremendous investment in studio time, in hiring musicians and so on. It's possible to create a fully orchestrated, big sounding piece of music at home. And this is an exciting development, because I've felt that in the twentieth century the focus has been on performers, and the creation of new music has sort of slipped into the background except in the pop field."

Riesman's early interest in the Commodore 64 led him to develop, with Steven Buchwalter, *Cantus, The Music Improviser*, a disk-based program for the 64 that creates, in realtime, three-voice improvisations. Rather than typing in notes, you enter choices for tempo, harmony, rhythm, counterpoint, voice range, and tone color—from which *Cantus* improvises. Each of the

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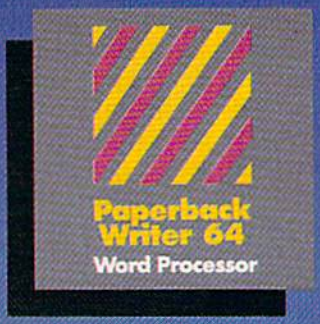

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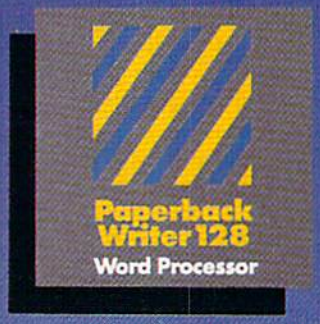

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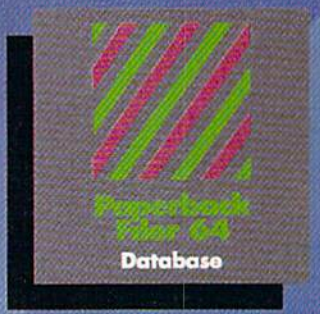

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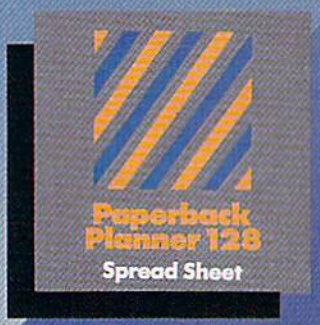

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choices you make becomes a "patch" that can be saved to disk and replayed at any time. The program comes with 65 such patches already on disk, representing a broad range of musical styles. You can also modify those patches.

Cantus requires no musical knowledge of the user, although it comes with a 48-page manual for those who want to explore how the program operates. *(Algo-Rhythm Software, 176 Mineola Blvd., Mineola, NY 11501, $39.95 plus $2 shipping.)*

Riesman says his interest in computers was an outgrowth of the earlier development of synthesizers with digital memory, sound sampling machines, digital recorders and reverberators, and similar electronic instruments.

"Most of the developments affected at this point are recording and composing activities, as opposed to live performance," he says. For example, digital memory in a synthesizer allows musicians to program all of their synthesizer sounds at home, then go into a studio and start recording right away. Prior to that, a musician would have to rent the studio space to do all of the programming as well as the recording.

Similarly, sound sampling machines have already begun to affect the way that a group like the Philip Glass Ensemble approaches concert dates. "For example, to do performances of a piece called *The Photographer*, which called for six female voices—well, that's something we can't afford to do on tour. We can't afford to take five extra singers along for one piece. With an emulator, however, we can *simulate* a chorus and are able to perform that piece of music.

"And, although we really haven't found it to be a replacement for live musicians, the emulator enables you to use fewer musicians and still get an orchestral kind of sound," he says.

The key to using computers with musical instruments has undoubtedly been the development of MIDI, Riesman adds. "It's a dream come true. Before there was MIDI, I was looking around for someone to do some custom work for me in interfacing keyboards. I had gotten into the practice in the studio of playing two keyboards at the same time, as one way of getting more complex, more interesting synthesizer sounds, or doing multiple overdubs of the same part.

"So I was just dying for something to link keyboards together. Both from the standpoint of doing a live performance or a recording studio performance, having multiple synthesizers under one keyboard's control—and from the point of view of sequencing software—MIDI development is really terrific."

In addition to all of the new options for musicians, there are also a number of troubling questions involved with the development of digital, computer-based music. Critics of electronic music have complained of its mechanical, sterile sound and its departure from traditional music sounds and forms—although the number of those complaints has been reduced as instruments become more sophisticated and performers more proficient in their use. Sound sampling devices also raise issues relating to the use—or misuse—of a performer's sound and the threat that some musicians may be put out of work.

The amazing capabilities of digital sound sampling machines have already given rise to the ability to have virtually anything recorded—or sampled—and then reused over and over again even without the performer's knowledge, says Ron Bienstock.

For example, Bienstock says, a well-known rock musician recently called in a well-respected acoustic bass player and paid him to play on one cut of an album. "They paid him a single-session fee. He goes home, and the next thing he hears from people on the street is that he's on *three* cuts. Now, that is something that the unions—in terms of their laws and rules and enforcement problems—are facing at the moment," he says. Once you have digitally sampled a sound, it can be reused repeatedly, or even changed in ways that make it unrecognizable.

"There's the problem. When have you taken too much, and how far can you go? It's going to get to the point where everybody will have a sampling unit of some sort within their reach, probably within the next year," Bienstock says. Although the courts have not yet begun to hand out rulings in this area, Bienstock expects the legal rulings will be fascinating.

"All my attorney friends who I spoke to from major firms—copyright firms—they don't know anything about this technology," he says. "I recently got called into a major firm, and really it was an amazing event. I was talking to six attorneys, a minimum of 12 years each in copyright and trademark experience, who were taking notes and saying, 'Sampling...is that with an *a*?' They were very much in the dark."

Sound sampling devices also pose real problems for certain musicians, especially those who make money as session performers, says Riesman.

"There's no doubt that samplers have put people out of work. When you talk about the session musician, the violin players and so on, who don't get the sweetening dates they used to because of synthesizers being used—well, that trend is going to continue," he says.

But, says Bienstock, "Interestingly enough, it hasn't had a real impact upon a lot of recording studios because you still need a place to be able to play live drums and do vocals in a real sound area conducive to quality."

Although Bienstock is quick to point out the advantages that computers and MIDI-connected electronic equipment can have for composers and musicians, he feels that computers haven't yet had a major impact on the average working musician. That's especially so for guitar and bass players, who are just beginning to witness the first real breakthroughs in MIDI-guitar technology.

In the long run, both Bienstock and Riesman agree that musicians will find more opportunities than problems when it comes to integrating computers and digital electronic equipment. But that doesn't mean that all musicians have to get wired into the electronic, computerized world.

Says Riesman, "There's still plenty of room for musicians who just want to play their instruments and ignore the whole thing."

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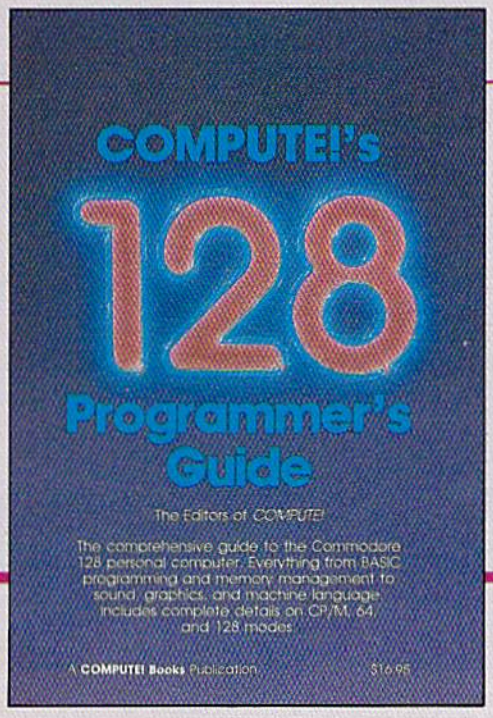
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INTERVIEW

The Music of JAN HAMMER Miami Vice

Selby Bateman, Features Editor

Almost singlehandedly, composer and musician Jan Hammer has altered the sound of network television

Each week, from a computer-controlled 24-track music studio on his ten-acre estate in New York, Hammer composes, performs, and mixes the musical score for another episode of the innovative action series, Miami Vice. *He creates for the program an eclectic mix of synthesizer-based pop-rock; powerful, haunting melodies; and background themes ranging from reggae to rockabilly. Hammer draws from—and contributes to—what has become the unique* Miami Vice *look and feel.*

Despite crushing weekly deadlines, Hammer has drawn both critical and popular acclaim for the consistently high quality of his compositions and performances. Along the way, he's also picked up Emmy nominations, a No. 1 hit single, and a No. 1 album, all for Miami Vice*—the first time a television sound track album has climbed to the top of the charts since Henry Mancini's 1959 record,* The Music from Peter Gunn.

To accomplish all this, Hammer benefits from the startling power and versatility of the latest computer-controlled electronic instruments. Only in the last couple of years has technology offered a musician working alone the necessary tools to create extraordinary and complex music. With today's technology, a single musician has the freedom to be a one-man symphony. Hammer works his weekly magic with an array of synthesizers, drum machines, keyboards, guitars, and sound sampling units—plus a personal computer with hard drive—all connected through MIDI (Musical Instrument Digital Interface) devices. (See "Computers and MIDI"elsewhere in this issue.)

It's somewhat ironic that a quintessentially American cops-and-robbers program is being musically scored by a classically trained composer born and raised in Czechoslovakia. But Hammer, 38, is no stranger to American music. Arriving in the United States from Prague in 1968—just before the Soviet invasion of Czechoslovakia—Hammer quickly established himself as a composer and performer of great versatility. He has performed with many jazz and rock superstars: Sarah Vaughan, Mick Jagger, Jeff Beck, John McLaughlin, Carlos Santana, Billy Cobham, Stanley Clarke, and Al DiMeola, among others. He was a founding member of the jazz-rock group, The Mahavishnu

Orchestra, and more recently played on Mick Jagger's first solo album, She's The Boss.

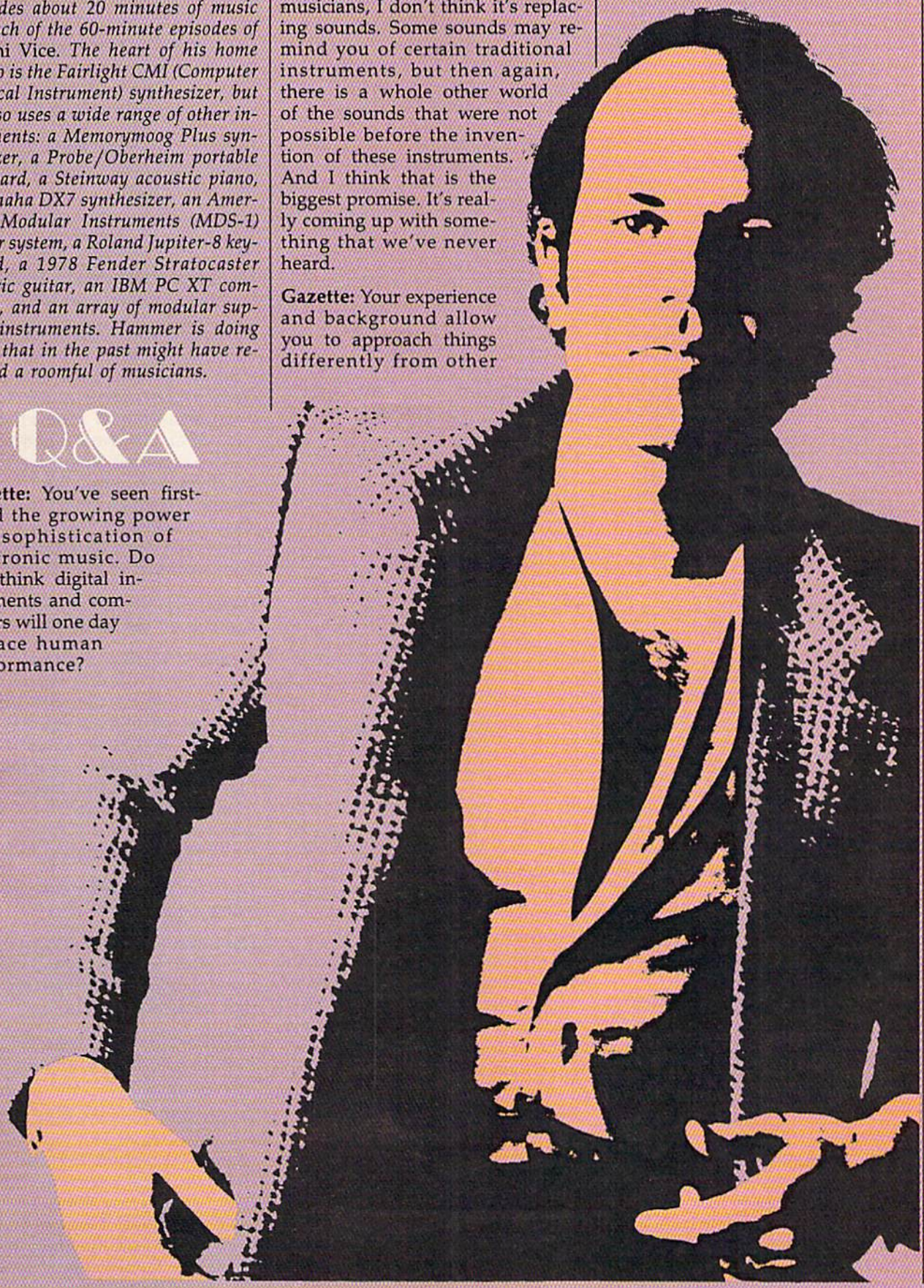
As a one-man orchestra, Hammer provides about 20 minutes of music for each of the 60-minute episodes of Miami Vice. *The heart of his home studio is the Fairlight CMI (Computer Musical Instrument) synthesizer, but he also uses a wide range of other instruments: a Memorymoog Plus synthesizer, a Probe/Oberheim portable keyboard, a Steinway acoustic piano, a Yamaha DX7 synthesizer, an American Modular Instruments (MDS-1) guitar system, a Roland Jupiter-8 keyboard, a 1978 Fender Stratocaster electric guitar, an IBM PC XT computer, and an array of modular support instruments. Hammer is doing work that in the past might have required a roomful of musicians.*

Q&A

Gazette: You've seen firsthand the growing power and sophistication of electronic music. Do you think digital instruments and computers will one day replace human performance?

Hammer: I don't think that they'll ever take over. I think they'll expand the field of music tremendously. I don't think it's replacing musicians, I don't think it's replacing sounds. Some sounds may remind you of certain traditional instruments, but then again, there is a whole other world of the sounds that were not possible before the invention of these instruments. And I think that is the biggest promise. It's really coming up with something that we've never heard.

Gazette: Your experience and background allow you to approach things differently from other musicians using the same equipment. I'm sure you've already seen a number of television shows that try to mimic your style.



Hammer: I think what really makes a difference in my case is what kind of music I write, regardless of the instrumentation or the mode in which I put the music together. It comes down to "You hear a melody that moves you. Do you hear a musical idea that makes you feel something?" And that will always be the bottom line. There is no substitute.

> "It comes down to 'You hear a melody that moves you. Do you hear a musical idea that makes you feel something?' And that will always be the bottom line. There is no substitute."

Gazette: From a technological standpoint, could you have accomplished several years ago what you're now doing every week for *Miami Vice*?

Hammer: From *any* standpoint, really, it would be impossible. It would take me twice as long.

Gazette: What's been the biggest change over the past year or two?

Hammer: I would say the better software that became available; especially in the case of the Fairlight CMI, which is an upper-end digital synthesizer. But that's not really doing it justice. It's an incredible machine that not only creates sound from scratch, but also is a great sampling machine—little snippets of digital recordings that can then be replayed from a keyboard at any pitch.

Gazette: And you use that extensively...

Hammer: Yes, very much. And also, there are quite a few programs as part of the software package for the Fairlight, where you can sequence, string together compositions, pieces of music. And in different modes: one is directly playing it from the keyboard, another one is typing in the values, another is doing it with a light pen on the screen. You can edit musical compositions like that. Those things have grown.

And also there is another wonderful thing that's just happened recently, especially now that MIDI has really taken off. People have been writing programs for microcomputers. For instance, I have a wonderful program [*Texture*, a modular sequencing program from Cherry Lane Technologies] that Roger Powell wrote. [Roger Powell is keyboardist for Todd Rundgren's band, Utopia, and director of product development at Cherry Lane.] It's available for many computers, but I have an IBM XT. And this thing, you just put a MIDI interface card into an IBM, then you can connect as many synthesizers—up to 16—and run them on separate MIDI channels. And basically playing performance in realtime, playing sections of pieces of music that you can then combine in the same manner that a word processor would help you with words.

Gazette: Several years ago, that would have been impossible with a microcomputer.

Hammer: Right. It makes it available to the masses, really.

Gazette: Do you use the Fairlight in conjunction with your IBM?

Hammer: Yes. They're both running all the time. The Fairlight is more of an incredible sound machine, where I pretty much store all my drums—all my drums that you hear—but different tunings. And they're all stored on the disks. I can put them together in different combination drum kits that I can recall. They're stored as instrument files where you have different types of drums combined into drum kits.

Gazette: How is memory storage handled on the Fairlight?

Hammer: Eight-inch floppies, double-density, double-sided. They have a new system coming out that's going to be hard-disk supported as well. I have a hard disk on the IBM, and it's incredible [laughs], the advance that I've made to that level of organization. You know, going through subdirectories, and really organizing my world here.

Gazette: How long have you been using a computer?

Hammer: The IBM I just got recently, a few months ago. I've been working with the Fairlight for about four years now.

Gazette: Have you been using the IBM directly in any of your *Miami Vice* compositional work?

Hammer: Absolutely. That's what's so wonderful with the program—it's called *Texture*—it's a compositional program. You can really do amazing things with that. I can sketch out things in advance, even before I see the final cut of the show, the final timing. And then I

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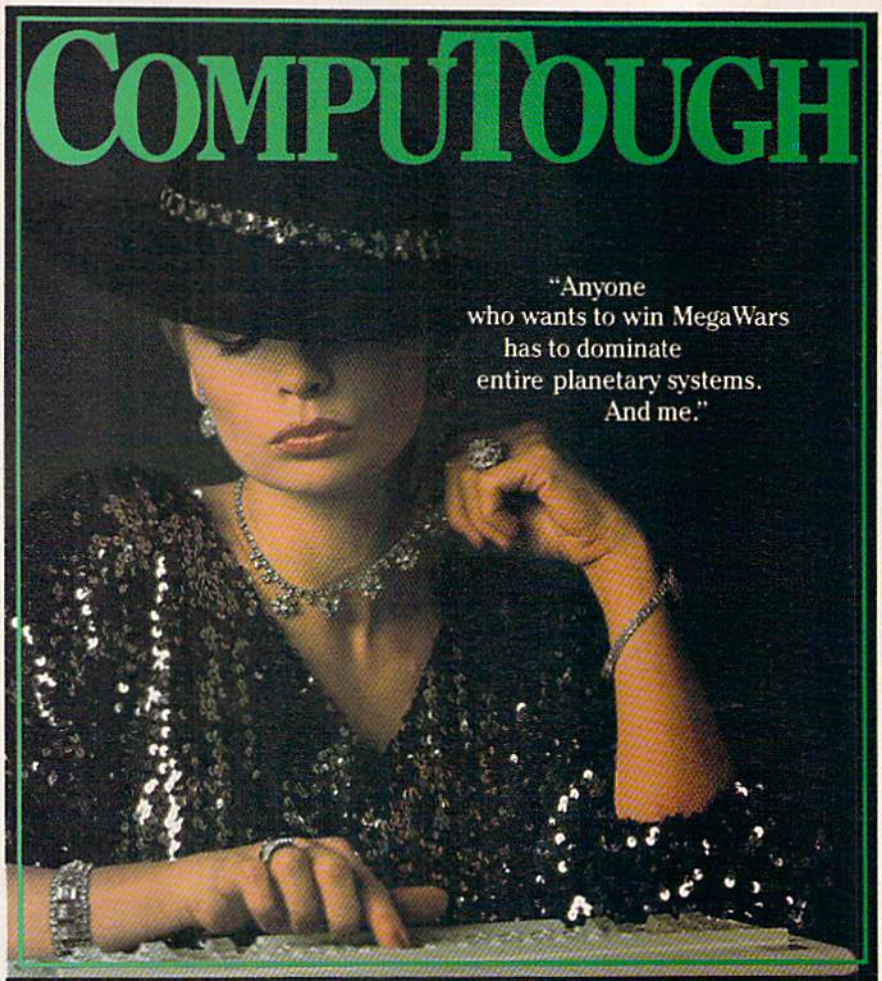

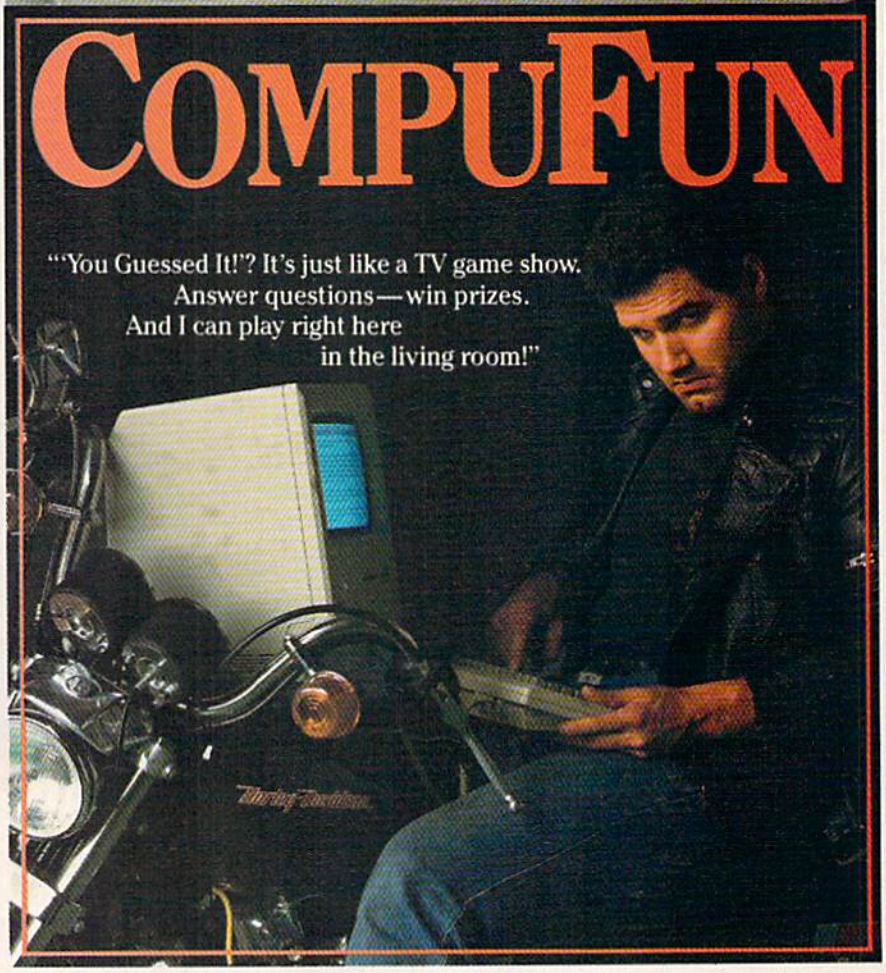
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can perform the piece of music and do last minute changes before I actually commit the music to tape, because it's all pliable. It's like building blocks.

Gazette: What was your first exposure to digital music?

Hammer: I just heard amazing sounds on a few people's records; I can't even remember who it was. Different people started using the Fairlights initially, and then other things like the Synclavier [another high-end synthesizer], started showing up. And it started sounding different. And the most intriguing thing about it was that it did sound different. It sounded unlike anything I'd ever heard.

Gazette: What was your first exposure to a computer, and how did you end up choosing the IBM PC XT?

Hammer: It was the one computer that could do all the things that I needed. And the programs were available for it. For instance, on the IBM, when I'm not composing using the *Texture* program, then when I'm doing the final mix-down on my console, the IBM is running the automation. And it's just writing the levels and mutes and everything on my console, so the whole mix is actually written onto the hard disk on the IBM.

That is one computer that can do all these things for me. It can also keep track of all my sounds on the Yamaha, for instance. I have a whole library of sounds that gets stored in another subdirectory on the hard disk as well. So, there are already three incredibly different applications that just one computer can do. And I don't know of another computer that has that much software written for it.

Gazette: This idea of a library of personal sounds opens up a new world for musicians. Will this raise any problems when sound sampling allows anyone to duplicate those things you've created?

Hammer: That depends. If it's a snippet of a sound, there's nothing I can do. But if it's a sixteen-second sample of a melody I wrote, then it's copyright infringement. That's not giving away the store. I don't see that I will be robbed of anything.

Gazette: You score the soundtrack to *Miami Vice* from your home studio. Do you ever work in Miami where the program is shot?

Hammer: I did a quick cameo guest shot last fall, and then we get together once in a while, like at the Emmy Awards.

Gazette: Does it help you to get together with the actors and production people?

Hammer: It's nice; we have some fun. They're quite an exciting bunch of people working on the show.

Gazette: How do you actually go about scoring an episode of *Miami Vice*?

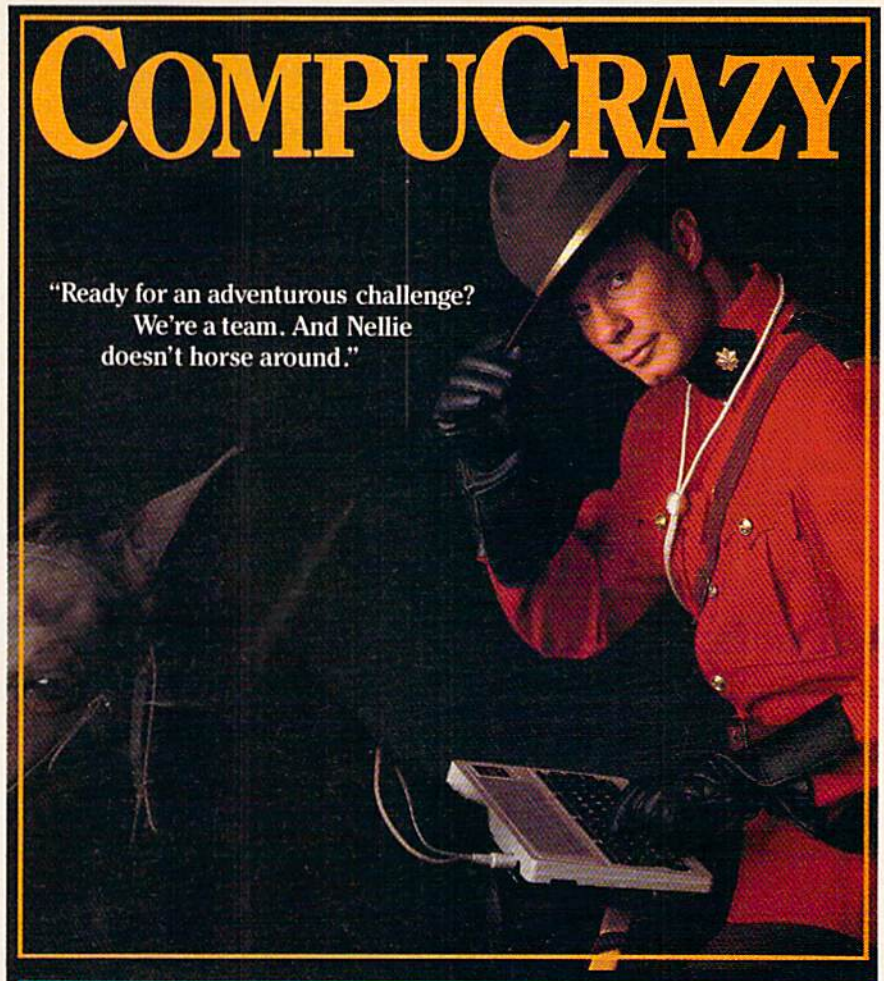
Hammer: Most of the work really gets done after I see the show in its rough form. It's all pretty much a seat-of-the-pants kind of thing—gut feeling. I just go with my instincts. I don't have time to do anything else. I really have to go with my instincts, and it has to be the first time. So, there aren't many changes. The only changes that there are are done as far as the timing and the lengths of individual sections and stuff like that.

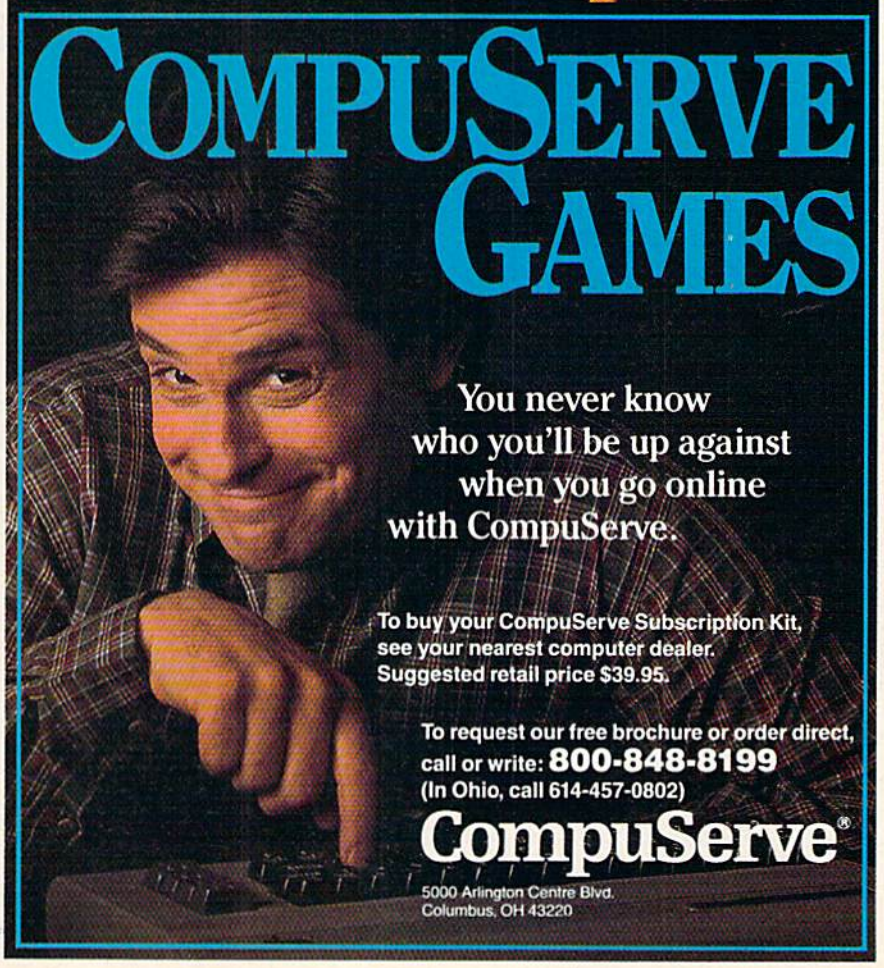
Gazette: Do you use the same group of instruments each time?

Hammer: Just the opposite. I try to give each show its own flavor, its own specific themes, in addition to the *Miami Vice* theme which was the hit single—that's on every show, but that just opens the show and that's it. Then when the story really starts, there are different themes for each week, which is quite unusual in television scoring. So, it's sort of like a mini-movie, and it's really quite a pressure.

Gazette: In a number of the episodes, you type music to certain individual characters or actors. Are you improvising that, or do you work from a plot line?

Hammer: I only work from the picture. There is no time to really read scripts, and get really involved like that. I'm like the first-time viewer; I just get caught up in the action, and if it's scary or exciting or depressing or whatever it is, I respond to it in that way. However it hits me, it's

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my subjective response to it.

Gazette: What's your hardware setup in your studio at home?

Hammer: There are two alphanumeric keyboards—one is the IBM and one is the Fairlight. And then I have my favorite piano instrument keyboard that I actually play a lot, the Yamaha DX-7, which is just about the most amazing thing. And that is connected through MIDI to just about everything else. I have a Memorymoog [synthesizer] that's the most beautiful sounding old-fashioned analog instrument. And then I have a Roland synthesizer. And I can directly play the Fairlight from the Yamaha keyboard—I just really like the feel of the Yamaha keyboard, it's my favorite.

Gazette: And then you add your own sounds to this, for instance with the Stratocaster guitar?

Hammer: When it's a real guitar, I actually play the part on a guitar. There are certain strumming techniques that just cannot be approximated.

Gazette: Will we reach a point when even a guitar can be replaced by a digital machine?

Hammer: I think we can evoke the feeling of a guitar, and that's been something I've been pursuing for years. And I've had all kinds of success with that. But there are some things I will never be able to do—or at least that I cannot even foresee being able to do—simply because I cannot imagine the controller that would allow me, a keyboard player, to produce an impression of strumming six strings rapidly across. That's where the problem is, the interface between the human being and the computer.

Gazette: There have been complaints from some that digital instruments, such as drum machines, produce a sterility of sound. Will we always see live drums being used?

Hammer: I'm sure you will. But the point is that the fine line is disappearing because drummers are starting to program these things. And when you say drum machines, you're probably talking about something old-fashioned, low-end. The way it's going now is that there's velocity sensing on each drum, where the dynamics are infinitely variable. And if you have a drummer's mind connected to this—if a drummer programs a good computer like that—you cannot distinguish the results. It's really erasing that old stigma. Definitely the Fairlight is like that. With the shading of dynamics and all that, you can really do something much more real and involved than it used to be.

Gazette: To your knowledge, has anyone previously approached the scoring of a television show as you are—one-on-one, with just days between when you receive the videotape and when you have to finish a score?

Hammer: I don't think so. Because that really started out as a flash of inspiration from Michael Mann, the executive producer [of *Miami Vice*], where from the first episode after the pilot, he told me to go ahead and do it the way I wanted it. And I don't think anyone has ever been given this amount of freedom. And that makes all the difference, because I do better work when I'm not interfered with [laughs].

Gazette: For more than a year now, you've gone through a series of very compressed periods of composition and performance for *Miami Vice*. Would you like to keep this up, or do you want a break to do some other things?

Hammer: Well, the season is 22 weeks, and last summer I was working on the album. But this summer I'm definitely going to take it easy. There are also a lot of films for which I'm getting offers, and I have to turn them down because it's just impossible in time.

Gazette: What's the next step in making your life easier as a composer and a musician?

Hammer: I would like to have a limitless supply of inspiration [laughs]. The technology is going along just fine. I'm not worried about technology anymore. I'm sometimes worried about being able to keep up with the ideas that feed the technology.

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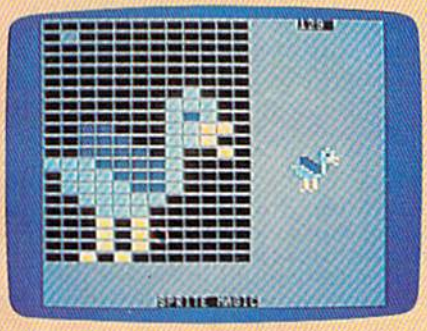

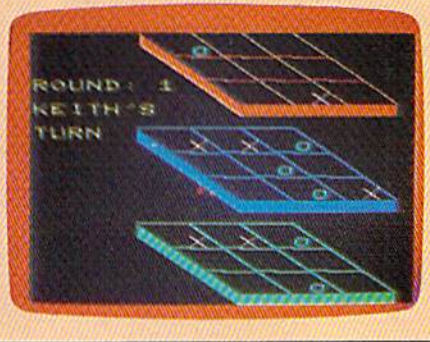

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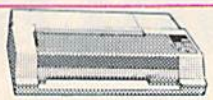

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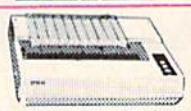

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Computers And MIDI

Kathy Yakal, Assistant Features Editor

Over the past couple of years, a lot of music software has been published for the Commodore 64—programs that let you compose, edit, and, in some cases, print out musical pieces. Some programs also serve as tutorials, helping you learn about music as you go along. A few companies have even produced keyboards that can be attached to the 64 to play music. The 64's SID (Sound Interface Device) chip lends itself well to creative applications. But beyond serving as a musical instrument itself, your Commodore 64 has the ability to *control* other digital musical instruments. It's now possible to compose a melody and hear it played by up to 16 synthesizers or drum machines. The music would be played flawlessly because your 64, acting as symphony conductor, is telling each instrument which notes to play and how to play them.

Professional musicians have used electronic synthesizers, sequencers, and digital sound samplers for years to compose and perform music. Though each of these devices individually has made the creative process easier, their ability to work together was, in the past, very limited. If you wanted three synthesizers to play together, you would have needed a musician at each of the keyboards.

In 1982, a number of major music hardware manufacturers agreed to adopt a set of technical specifications that would become an industry standard. This standard, *MIDI* (Musical Instrument Digital Interface) makes it possible for any musical device that uses MIDI circuitry to work with any other device equipped with MIDI. Musicians could, for the first time, have many of their electronic music components "talk" to each other.

What started out four years ago as a way for electronic musical equipment to be compatible now has important ramifications for personal computer owners. If you're interested in exploring some new musical possibilities with your Commodore 64, you may want to see what* MIDI *can do for you.

To do this, two things were necessary: a hardware interface that would connect two or more units, and software that could do the translating. Both would adhere to the MIDI standard. MIDI is not a physical interface in the traditional sense, or even a software program. Rather it is a set of minimum technical specifications necessary for compatibility. This allows hardware and software manufacturers a lot of freedom, yet offers musicians powerful tools that work together as they never have been able to.

There's another player here: the personal computer. Computers, with their enormous processing capabilities, are ideal controllers for electronic musical instruments. Many manufacturers have developed interfaces that can connect a personal computer to a keyboard or drum machine or other digital instrument, and software that drives the coupling. Using such a configuration, you can very efficiently compose, edit, and play multi-instrument compositions as a solo musician. MIDI controllers use a serial bus with up to 16 different channels. The instruments are daisy-chained, with only one actually connected directly to the main computer. (It's similar to plugging a printer cable into the disk drive and the drive cable into your 64. When you make a printout, the disk drive ignores the signals coming from the computer because it knows they're destined for the printer.) Each instrument has its own number and can tell if a command should be acted upon or ignored. Sequencers can define various MIDI channels through which musical information can be sent to particular synthesizers while ignored by others not listening to that channel.

Musical data is transmitted among MIDI devices through three kinds of ports. MIDI OUT ports transmit data from the computer or instrument that's in charge. MIDI IN ports receive. And MIDI THRU ports pass information along to the next device in the chain. On the Commodore 64, MIDI interfaces (containing MIDI OUT and IN ports) are plugged into the cartridge port, and then cables are run to whatever other MIDI device you're using, such as a synthesizer or drum machine. Most of the time, the MIDI cable carries requests to play individual notes, but there are other musical events which can be controlled as well. Almost every synthesizer, for example, can be programmed for different sound envelopes. MIDI programs can usually ask an instrument to switch envelopes in the middle of a song, from a piano-like sound to a tuba timbre, for example. Also, such data as individual note attack, aftertouch (how quickly a key is released), sustain, pitch bend, and vibrato can be sent via MIDI.

Most MIDI interfaces come with some software, at least some kind of demo program. If you plan to buy software from a different manufacturer, make sure that it's compatible with all of your MIDI devices and interfaces. Most programs are written for a specific synthesizer or other MIDI device but will also work with a few others.

The International MIDI Association (IMA) is a good place to go for MIDI technical information. The IMA is a non-profit organization made up of manufacturers, musicians, educators, and other people interested in electronic music. If you want a copy of MIDI 1.0 specifications and a 50-page detailed explanation of MIDI by the MIDI Manufacturers Association, the IMA sells them for $35 ($30 for members). Initial IMA membership fee is $40, and annual dues are $25.

A complete explanation of each interface and program's features is not possible; we'll use the software categories set up by the IMA for purposes of general identification.

A MIDI **sequencer** is a computer program (or separate peripheral) that records and plays back music performed on MIDI devices. Sequencers can be extremely sophisticated: They can correct rhythmic errors, transpose, invert, time reverse, append, merge, and permit a variety of realtime musical manipulations. In addition, "recording" can be via direct entry into the computer, step-time playing, or realtime playing.

A **librarian** facilitates the storage of programmed sounds or any internal data for specific MIDI devices.

A **programmer** allows the user to modify the programmed voice parameters or any other internal data for specific MIDI devices via the computer.

A **printer** prints out recorded music in standard music notation.

(For more information on MIDI, contact the International MIDI Association, 11857 Hartsook Street, North Hollywood, CA 91607.)

Following is a list of MIDI hardware and software available for the Commodore 64. For further information, please contact the manufacturer or publisher.

Cherry Lane Technologies
110 Midland Ave.
P.O. Box 430
Port Chester, NY 10573

CZ Rider
Programmer/Librarian
$149

Dr. T's Music Software
66 Louise Rd.
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$150

Echo Plus
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$90

CZ Patch Librarian
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$95

DX Patch Librarian
Programmer/Librarian
$100

Hybrid Arts
11920 Olympic Blvd.
Los Angeles, CA 90064

MidiTrack C
Sequencer only, $149
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$349

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CZ-Patch
Librarian
$79

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P.O. Box 60238
Station A
Palo Alto, CA 94306

Data 7
Programmer/Librarian
$125

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$125

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Programmer/Librarian
$95

Moog Electronics
2500 Walden Ave.
Buffalo, NY 14225

Song Producer
Sequencer/Editor and MIDI interface
$295

MusicData
8444 Wilshire Blvd.
Beverly Hills, CA 90211

MIDI Interface
$100

MIDI Sequencer I & II
Sequencer/Editor
MS I *(real-time editor) $95*
MS II *(programmable) $175*

Sound Filer
Librarian
$75

MIDI Merger
Utilities
$50 (MS I only)

Passport Designs

MIDI/4 Plus
Sequencer/Editor
$99

MIDI/8 Plus
Sequencer/Editor
$150

Master Tracks
Sequencer/Editor
$249.95

MIDI Player
Utilities
$99.95

The Music Shop
Sequencer/Editor/Printer
$149

MIDI Interface
$199.95 (with tape synch)
$129.95 (without tape synch)

DX-7 Librarian
CZ Librarian
Juno 106 Librarian
JX-8P Librarian
OB-8 Librarian
Librarians developed by Computers and Music

QRS Music Rolls, Inc.
Micro-W Distributing
1342B Route 23
Butler, NJ 07405

MIDI Magic Interface
$49.95

MIDI Magic I/O Interface
(includes drum sync connection)
$99.95

RolandCorp
7200 Dominion Circle
Los Angeles, CA 90040

MUSE (MIDI Users Sequencer/Editor)
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$150

Sequential Circuits
3051 N. First St.
San Jose, CA 95134

MIDI Interface
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Syntech
23958 Craftsman Rd.
Calabasas, CA 91320

Studio 1
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Studio 2
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Song Player
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DX/TX Master
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MIDI Studio
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MIDI Interface
$129.95 (with drum sync)
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Unicord/Korg
89 Frost St.
Westbury, NY 11590

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Sequencer/Editor
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MS11C
Sequencer
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KVE-800C
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$99.50

KVE-DW8C
Editor
$99.95

Arcade Baseball

Kevin Mykytyn and Mark Tuttle

Here's a computerized version of the once-popular mechanical baseball game found in the pre-electronic arcades. The only difference is you don't need any dimes or quarters to play. An exciting one- or two-player game for the Commodore 64.

Spring training is over and baseball season is under way. Here's a chance to do some swinging and pitching against a friend—or your Commodore 64. "Arcade Baseball" is modeled after the mechanical baseball arcade game that was popular before computerized games dominated the scene. But this computer game offers a few options that the mechanical versions did not: You can choose to practice or play, and you can select an opponent: another person or your computer.

A Few Choices

After typing in the program, be sure to save a copy. To play the game, type RUN. First you're prompted to choose Practice (f1) or Play (f7). In practice mode, 20 pitches—a random mix of fastballs, changeups, curves, and sliders—are thrown so you can practice hitting. (To change the number of pitches thrown, change the value of RM in line 740.) No runners are displayed, and outs and runs do not accumulate. After all the pitches are thrown, you're asked again to select Practice or Play.

In Play mode, you're asked to select a one- or two-player game. Press the 1 or 2 key. If you wish to play the computer, select the one-player game. Now you're ready to begin.

The screen is divided into three sections. On the left is the playing field. Along the top of the field is a row of black holes. A batted ball will land in one of these holes, and each is marked with a result (single, double, triple, or out). To hit a home run, the ball must pass over the center of the rectangular ramp near the center of the field. (The crowd loves a home run and cheers when either team hits one.) At the bottom of the field is a specially designed bat.

The upper right corner of the screen is the scoreboard, which contains the inning, number of strikes, outs, and the current score. Players are represented as Visitor and Home. In the square below the scoreboard is a display of the baseball diamond, designed to show which bases are occupied by the team at bat.

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You must first choose a one- or two-player game. The one-player version—like the original arcade game—lasts for three outs. Your objective as batter is to score as many runs as possible before reaching three outs. The computer, as pitcher, randomly selects the type

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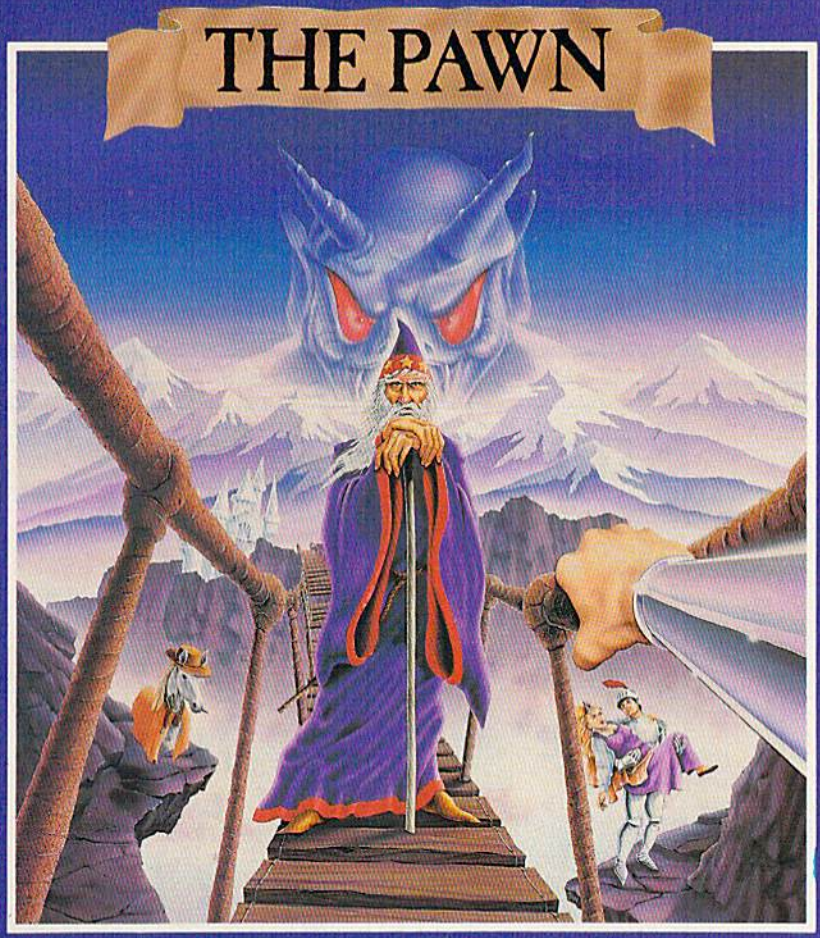

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See program listing on page 96.

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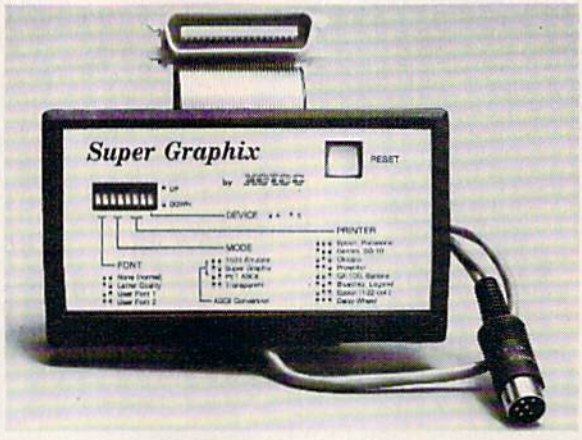

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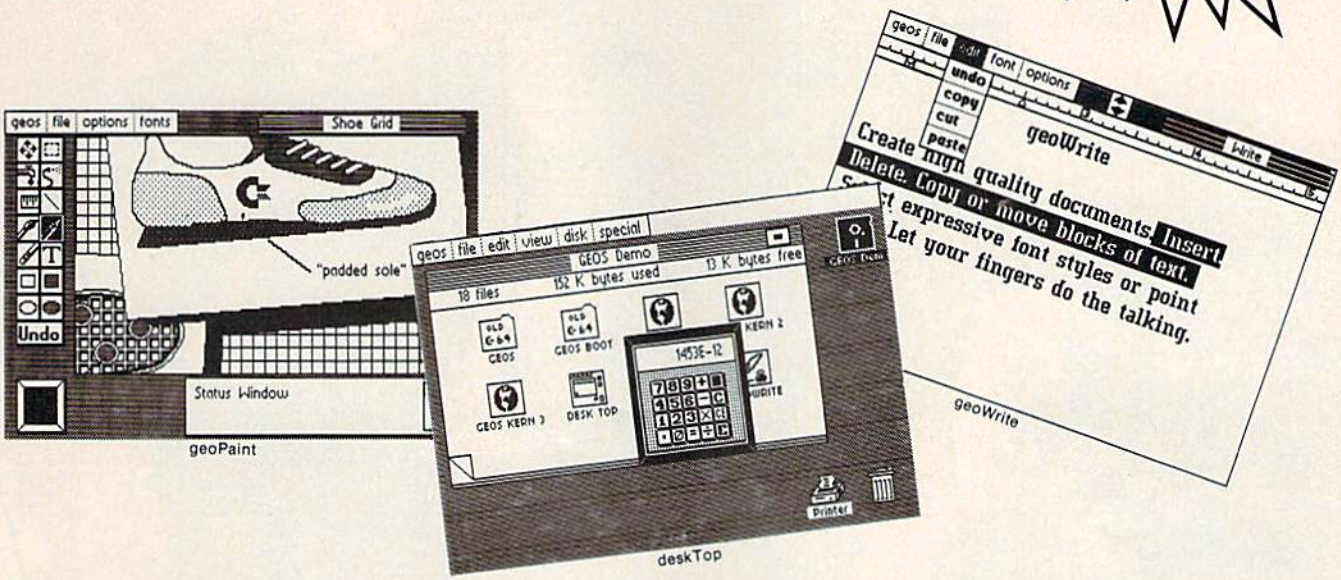

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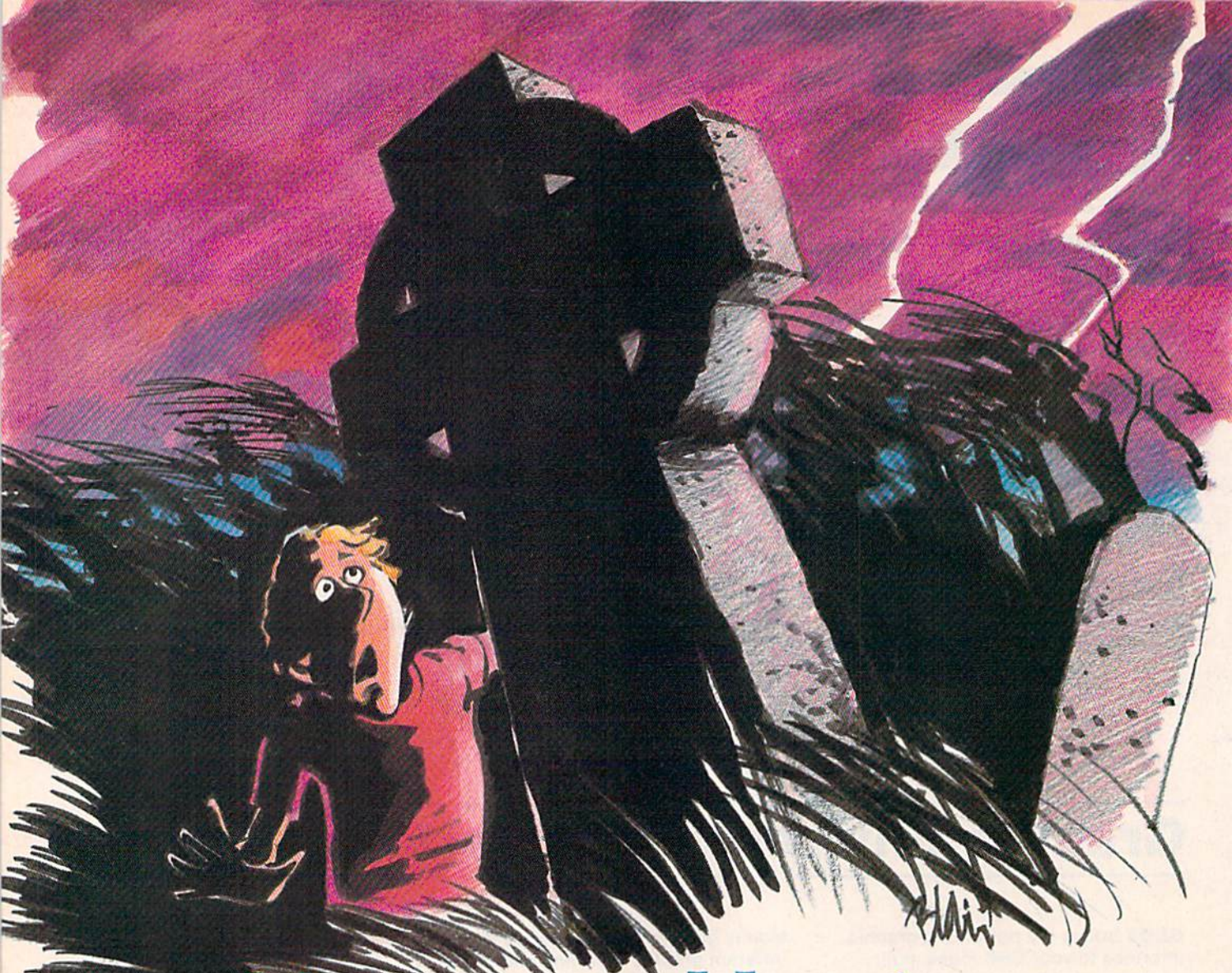

Vampyre Hunter

Marc Sugiyama
Game Concept by Gregg Keizer and Randy Fosner

This excellent adventure game combines text and graphics to create a world in which you hunt down a dangerous vampire terrorizing a small village. Your goal is to corner and destroy the monster. For the 64.

You stand at the outskirts of a small village, high in the mountains of eastern Europe. The townspeople have fled, for a vampire has taken up residence in the old castle nearby. Before they took flight, they managed to get a message to you. You're well-known in certain circles for your knowledge and expertise concerning esoteric lore. Only you can find and destroy the vampire. If you succeed, the villagers will be grateful. You find the mere existence of such evil repugnant; you *will* dispatch the vampire, you tell yourself.

The world of this adventure game may seem familiar (who hasn't seen one of the countless vampire movies?), but you'll delight in exploring it all the same. And even though you may *think* you know how to destroy a vampire, seeing the task through is not easy. Brute strength will do little good. Patience, careful investigation, and the right tools are needed.

"Vampyre Hunter" isn't a run-of-the-mill text adventure game. Not only do you talk to the computer through the keyboard, reading and typing in messages, but you'll also explore a mazelike castle, searching for the vampire's hiding place. Although you still provide directions and actions for your character while in the castle, you'll see it graphically displayed

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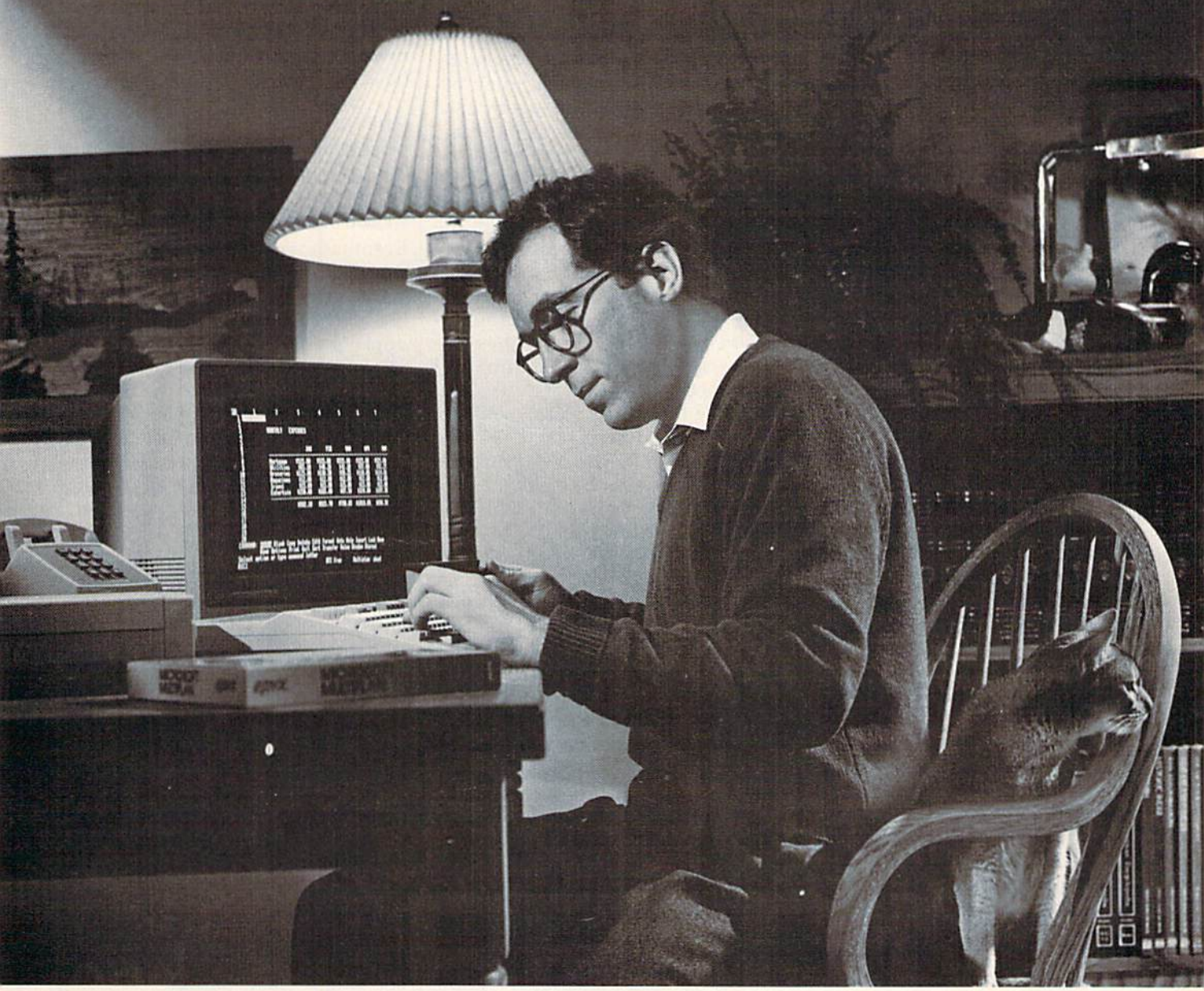

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on the screen, complete with rats, trap doors, dead-end passages, and thieving bats. Vampyre Hunter combines the best of both text adventures and graphics adventures to give you a unique world in which to participate.

Typing Instructions

Vampyre Hunter is a very long game. It will take some time to type it in. Be assured, however, that the final product will be well worth your time. The game is long simply because it's a text adventure game. If you look at Program 1, the BASIC section of the game, you'll see that much of it is DATA statements. There's just no way around this; in order for the program to talk to the player, the vocabulary and dialogue have to be included.

Program 1 is the BASIC portion of the game. Before you begin, review the page called "How to Type In COMPUTE!'s Gazette Programs," for details on how to type underlined letters and characters in {brackets} and {braces}. It's also a good idea to use "The Automatic Proofreader," published regularly in the GAZETTE. Pay close attention to the DATA statements and make sure that the spacing and spelling are exactly as listed. Note that several DATA lines have one or more commas in a row.

Program 2 is the machine language routine that creates the castle rooms, moves the creatures inside the castle, handles the text input, and controls the formatting of the text. You'll need a copy of "MLX," the machine language entry program published regularly in the GAZETTE, to enter this program. Load and run MLX and provide the following two addresses:

Starting Address: C000
Ending Address: CA97

Save Program 2 under the name "VAMPYRE.ML". If you use any other name, you'll have to change line 10 of Program 1, so it loads the proper program.

Once you've got both programs saved on tape or disk, you're ready to play the game. Load Program 1 as you would any other BASIC program. Type RUN, and the game begins. The first line in Program 1 loads the machine language portion of Vampyre Hunter. Tape users should change the number 8 at the end of line 10 to a 1 (LOAD "VAMPYRE.ML",1,1).

Issuing Commands

The screen first cycles through different colors. This is part of the machine language initialization routine and lasts about 90 seconds. When the screen stops changing colors, the BASIC initialization begins. The entire process may take up to two minutes, so be patient.

As long as you're outside the castle where the vampire resides, Vampyre Hunter is an all-text adventure. You start out south of the village. Communicating with the program is easy; as in most other text adventures, you simply type on the keyboard. You may use multiword commands to talk to the computer. Compound objects and sentences such as "Take the lamp and the food and go east" are permitted. The text parser is written entirely in BASIC, so if you issue long commands, be patient while the computer figures out what you said. Remember, though, that the computer has a limited vocabulary—if a phrase does not work, try something else. Only the first four letters of each word are significant (*knif* is considered to be the same word as *knife*, for example). You needn't include articles, such as *a* and *the*, as they are ignored. In addition, try to avoid the use of adjectives; they may confuse the word parser.

The input routine, which is part of the machine language routine, will not accept capital letters or commas, so you should avoid their use. It also rejects leading spaces and more than one space in a row.

If you've played text adventures, you'll be pleased to know that all of the normal abbreviations are available to you. For example, you can use the first letter of a direction, such as *n* for *north*. There are two other abbreviations; *l* stands for *look* and *i* for *inventory*. You can also use the *examine* command to look more closely at objects in the castle or the village, but be aware that these work only in certain locations.

Although figuring out how to communicate with the computer is part of the fun of playing an adventure game, there are some commands that need some explanation. For instance, the command *feed the fish* is invalid because you haven't said *what* to feed the fish. Likewise, the command *throw book* is invalid because you haven't said *what* to throw the book at. In addition, a command like *throw the book and the glass at the vampire and the dog* is invalid because there are multiple objects.

Only one command is specific: *Drive the stake into the vampire*. This command must have this word order or it will not be understood.

In the Vampire's Lair

Eventually, you'll find your way inside the castle. At this point, the game changes and becomes more like a graphic adventure game. The upper portion of the screen shows your position within the castle's interlocking rooms. Below the map is a text window where you'll issue commands and receive messages.

The castle has four levels. You enter on the top floor and work your way down. The vampire's coffin is on one of the lower levels. You'll need the lamp to travel safely through the castle. If you don't have the lantern, or if its fuel runs out, you'll be in complete darkness, and the screen display will disappear. Finding your way out is almost impossible in the dark. Don't leave things in the castle; they'll be scooped up by bats. Six items may be encountered inside the castle. Your character is represented by a figure in the center of the screen. The other figures are bats, rats, stairways, the coffin, and the vampire. There are hidden trapdoors throughout the upper levels of the castle. You won't always fall through them, but there's no way of knowing if one is ahead.

The vampire tends to wander throughout the castle during the night; it's safer if you avoid the castle during that time. If you do stay inside the castle during the night, hope that you have enough wards and weapons to keep the vampire from coming after you.

To make it easier to maneuver your character, you can specify more than one move at a time. If you want the figure to move five spaces north, for instance, type *n 5* (make sure there's a space between the two). You can move a maximum of nine spaces using this syntax.

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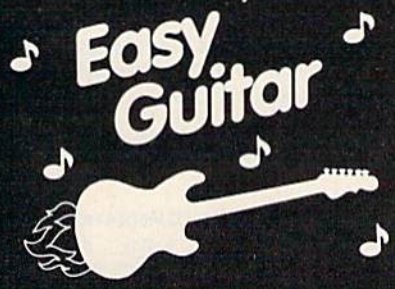

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The Importance Of Mapping

As you meander through the village, you may want to keep track of your movements by sketching out a map. Don't be in too big a hurry to enter the castle, there are several items you'll need to obtain before you can confront the vampire. If you fail in your first attempt, at least you'll have a map and some idea of where you need to move in the next game.

One of the challenges of an adventure game is figuring out which items are important and where they are. Thus, no more clues about how to win can be provided. You'll have to do it yourself.

Additional Options

There are certain system commands that you can use to change the game's format. The *color* command allows you to change the color of the screen, border, and characters. The *verbose* and *brief* commands control the length of the descriptions you receive when you move from one place to another. The *time* command tells you the time and the day. If you want to clear the screen and have it redrawn (for whatever reason), use the *clear* command.

If you should reset the computer during game play (by hitting RUN/STOP–RESTORE), you'll find that the screen is not behaving as it should. Press SHIFT–CLR/HOME, type POKE 648,4 (you won't see the characters; you'll have to type blindly) and press RETURN. This should return the normal screen. If you wish to exit the game, type *quit*.

Program Pieces

Here's a breakdown of the BASIC portion of Vampyre Hunter, Program 1.

Line Numbers	Description
10–205	Initialization
215–365	Sentence parser
375	Clear command
385–420	Drive stake
430–495	Lamp control
505–510	Winning
520–525	Losing
535–545	Nonsense commands
555–565	Color command
575–595	Time command
605–755	Give command
765–770	Brief/Verbose commands
780–790	Refuel lamp command
800–1000	Overhead
850	Handle the sun
880	Move wolves
905	Move vampires
925	Let wolves attack
940	Handle the lamp
970	Let vampire attack
980	Let animals attack
1010–1280	Go command
1290–1410	Take command
1420–1425	Quit command
1435–1540	Drop command
1550–1585	Inventory command
1595–1635	Return following noun numbers
1645–1705	Is noun here or held?
1715–1725	Next word all?
1735–1745	Next word but?
1755–1790	Return how long
1800–1965	Look command
1975–2110	Examine command
2120–2240	Make command
2250–2275	Chop command
2285–2405	Kill command
2415–2490	Read command
2500–2640	Eat command
2650–2655	Drink (falls into Eat)
2665–2705	Sleep command
2715–2740	Wait command
2750	Help
2760–2765	Input routine
2775	Return character in maze
2785–4055	DATA
2785	Constants/single variables
2815	Direction offsets
2820	Can't go that way messages
2840	Directions
2845	Times
2850	Verbs
2870	Nouns
2965	Multi-location noun data
2980	Foods
2985	Eating messages
2995	Places
3200	Signs
3205	Book
3250	Noun descriptions
3475	Place descriptions
4005	Miscellaneous numeric data
4020	Color commands
4045	Common error messages
4055	Places where sleep possible

The machine language section, Program 2, has this organization:

Memory Usage	Description
A000–BFFF	Castle storage
C000–CAB5	Machine language subroutines:
C000	Vectors
C012	Initialization
C0CF	Create castle
C20D	Create creatures
C241	Move creatures
C37F	Move the vampire
C435	CHROUT wedge
C50B	Input routine
C585	Copy maze to screen
C5DA	Miscellaneous subroutines
C976	Data
CC00–CFFF	Text screen
F800–FFBF	Character data
FFC0–FFFF	Sprite data

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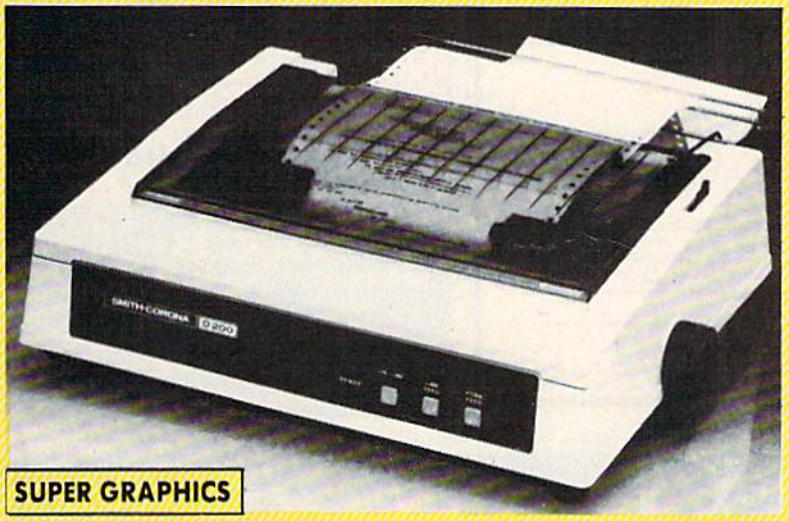

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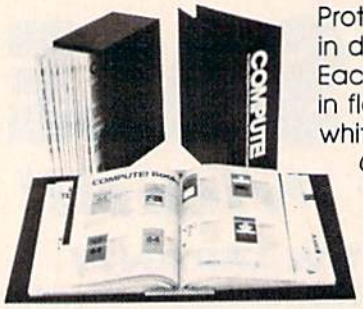

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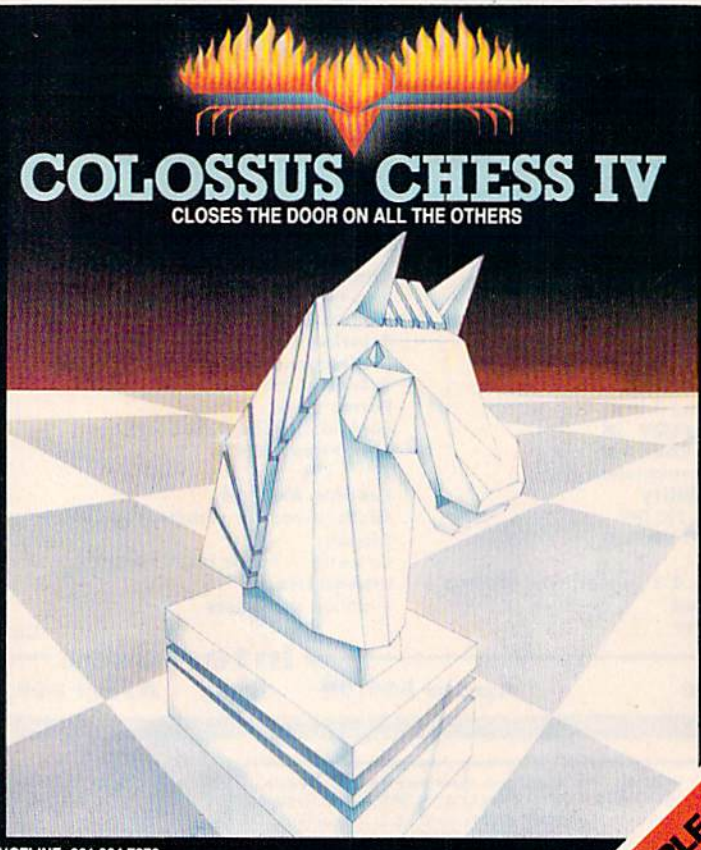

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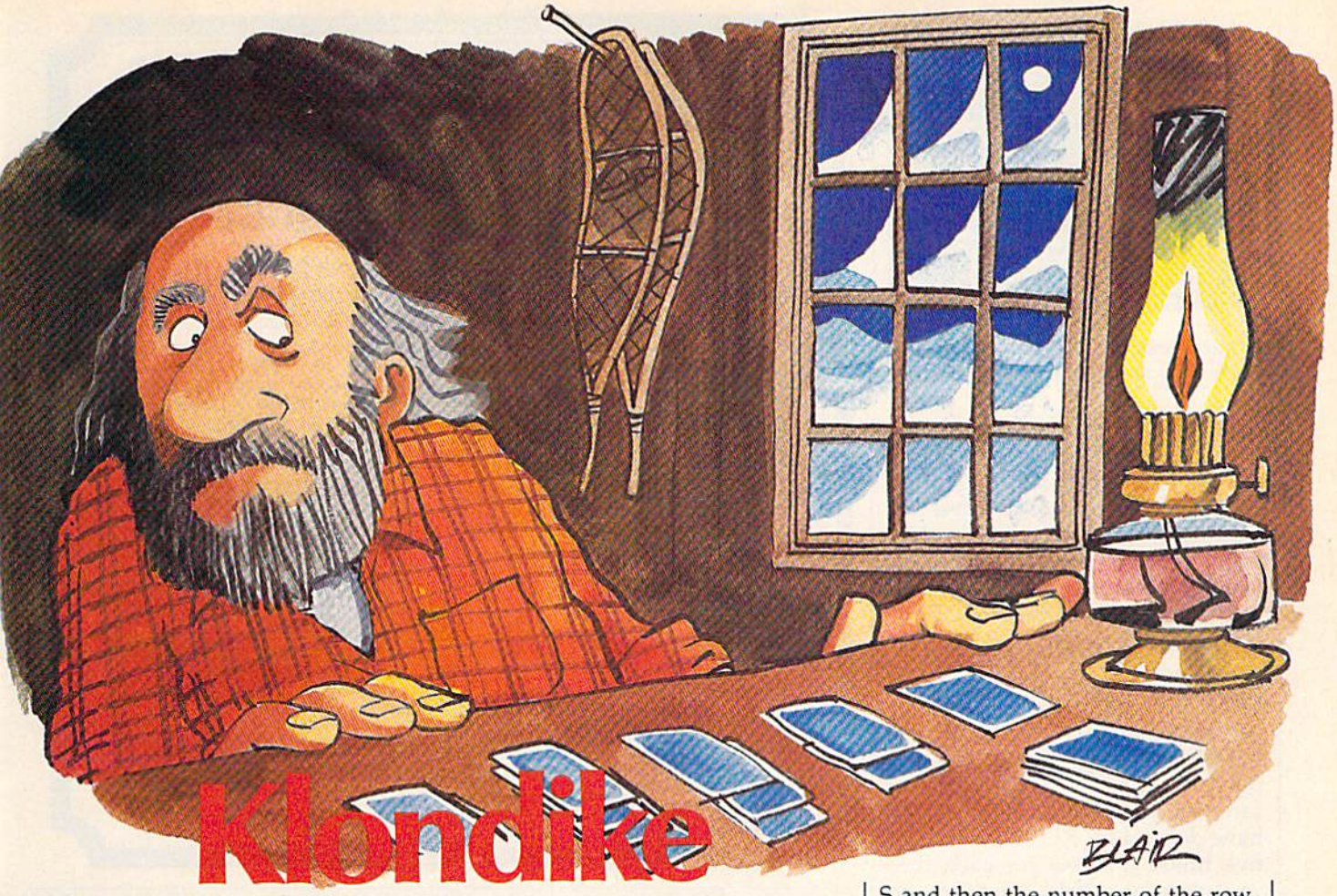


Klondike

James E. Hosek

Imagine a game of solitaire at which you can't cheat. Then imagine you've got high stakes riding on the game. "Klondike" is a computerized card game with a betting system and other interesting features for the Commodore 64.

Once you start playing "Klondike," it's hard to stop. If you've lost a lot of points, you'll be anxious to recover them; if you've won, you'll want to ride out your good luck.

Klondike is similar to the traditional solitaire card game. There are seven rows of cards; the first has one card, the second has two cards, and so on. On the right there is a pile for each suit, and at the bottom there is a deck from which to draw cards and a stack on which to discard.

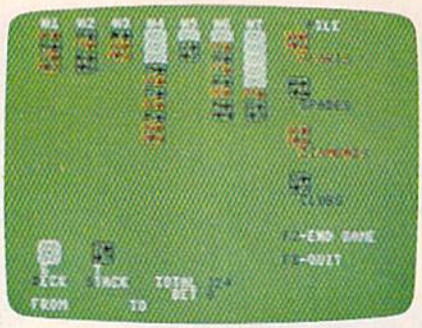
You can draw cards from the stack or the deck, and place them on the rows in descending order, alternating colors; or place them on the piles by suit in ascending order starting with the ace. The object of the game is to place as many cards on the piles as you can. However, since you probably won't be dealt all of the aces at the beginning, you'll need to place cards in the rows until they can be placed on the piles.

You can take cards from one pile and place them on another, so long as you keep them in descending order, alternating colors. If you move a card or set of cards from a row, the card beneath automatically turns over. If you move the last card in a row, you can place a king (and any cards descending from it) in the newly empty row.

At the bottom of the screen are the words FROM and TO. To move a card from the stack to a row, press S and then the number of the row. To move a card from one row to another, press the number of the row from which you want to move a card and then the number of the row you want to move it to. To draw a card from the deck, press D. Finally, to move a card from a row to a pile, enter the number of the row and then press P or F.

A Helping Hand

The game has an "Automove" feature, which scans the cards before each move to see if there are any cards that can be moved onto the pile. If there are, it automatically moves them for you, with some exceptions. A card won't be moved if another card that has not yet appeared can be played on it. For example, if the ace and two of clubs are the only cards on the pile, the three of clubs will not be moved up automatically since either the two of hearts or the two of diamonds can be played onto it. Also, a card will not automatically be moved if a card that can be played on it is covered in a row. Even if a card is not moved automatically, though, you can still move it yourself.



In this round, the player's best move might be to draw from the deck.

When you've turned over all the cards in the deck, the round of play is over and your score is calculated according to how many cards you got on the pile and how much you bet. Press f2 and the cards will be reshuffled for another round of play; press f8 to quit.

Placing A Bet

At the beginning of the game, you have 500 points. For each round of play, the maximum amount you can bet is the number of points you have divided by 52. You then earn five times your bet for each card you place on a pile. Therefore, in order to come out ahead, you must move at least 11 cards onto the pile. If you get all of the cards on the piles, you get 1000 times your bet. But don't count on it—it's difficult enough just to break even.

Typing It In

Type in Klondike using the "Automatic Proofreader," published frequently in the GAZETTE. If you're using tape, make the following changes: In line 120, eliminate GOSUB 1190. Then delete lines 1190 through 1230. Also, change line 1240 to read REM.

If you're using a Plus/4 or 16, substitute the lines listed in Program 2 for the corresponding lines in Program 1.

Once you've typed in Klondike, load it and type RUN. After entering your name, the playing screen appears. Enter the same name each time, as the program saves your latest total. If you don't like the cards that you've been given, you can reshuffle as many times as you like by pressing f7.

See program listings on page 98.

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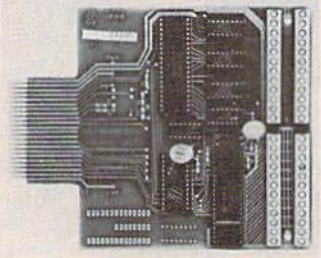

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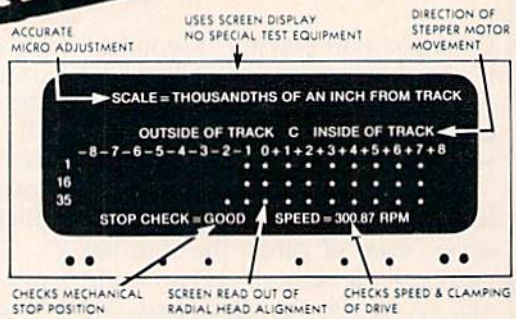
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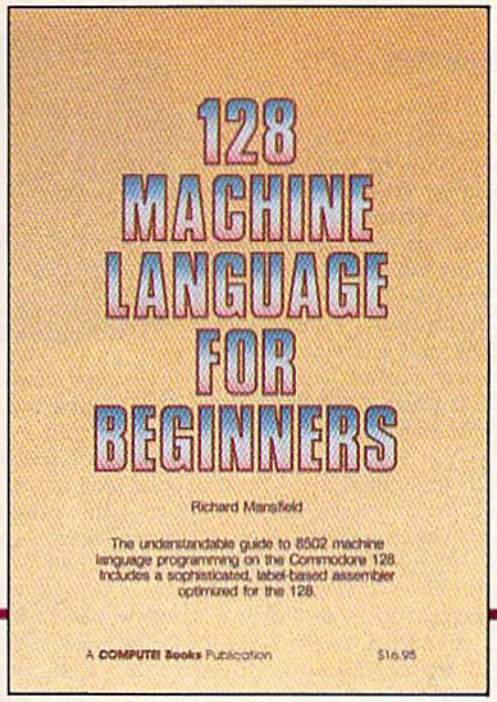

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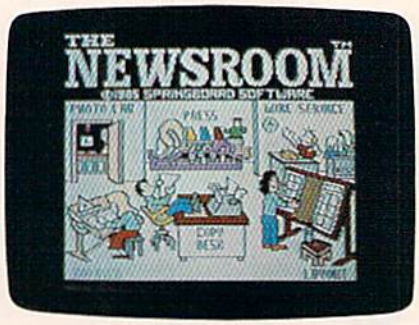
The Newsroom

Putting a newsletter together is not as much fun as you might imagine—that is, if your tools are the traditional scissors, tape, and a typewriter. Fiddling with spacing and alignment is not how I want to spend my free time. I say this—and yet I *did* agree to be editor of a club newsletter. The truth is I expected the Commodore 64 and a good software program to turn this into a happy experience for me. Someone recommended that I try *The Newsroom* by Springboard Software.

The Newsroom is designed to take the chore out of writing, designing, and printing newspapers, newsletters, brochures, flyers, and the like. Most all the elements of a publication are accounted for in the program. You create the banner, art, text, and layout on the screen and then print the completed master. No manual pasteup is necessary, not even for the artwork.

It certainly wouldn't hurt to read the manual before you begin. Students of journalism in particular can benefit from the brief tutorial on newspaper production. But if you're already about to miss your first deadline, you can skip that part and still manage; the program's design is largely intuitive. Sit down and start working on your publication right away, referring to the manual as needed. Pictures, or icons, show how to proceed through the various stages of production, represented by six scenes in the opening screen. At one time or another, you'll probably have work to do in the Banner, Copy Desk, Photo Lab, Layout, Wire Service, and Printing Press work areas.

If you've ever worked in an editorial/production department before, you'll find *The Newsroom* a familiar environment. You can jump from one work area to another as the task demands. There's no point, however, in going to Layout if your art and copy aren't ready. In a real work situation, the art department can get pretty testy if you try that. The result is the same at any rate—nothing happens. So, before anything else, you need to prepare the artwork and copy, and design a banner. *The Newsroom* gives you a choice of three large and two small typefaces for



the banner, and a scaled-down version of the same typefaces for the text. All margins and page lengths are set; all you do is provide the copy and art. You write and edit copy at the Copy Desk, using the program's text-editing features. There, a screenful of text is equal to one "panel." This will mean more when you get to the Layout work area where panels are put together to make up full pages. Don't worry about what to do where; the icons will guide you through each work area.

The Clip Art part of the program is probably the most fun. As you're creating a banner or planning your copy, you can choose from over 600 pieces of cartoon-style artwork included on a separate disk with the program. These ready-made pictures—including animals, people, aliens, and other figures doing a variety of things—can be combined and modified with graphics tools also provided in the program, or you can create your own pictures. A supplementary collection of clip art (*Clip Art Collection, Volume 1*) is available for $29.95, adding at least another 600 new images to your library. In addition, *Clip Art Collection, Volume 2* has recently been released for $39.95. It's targeted for business use.

It's easy to take some of the *The Newsroom*'s features for granted if you haven't had to do them manually before. For example, when you combine art with copy, the program automatically runs the text around the art. If you reposition the art on the panel, the text runaround is instantly recalculated. You're not penalized by having to retype copy everytime you want to try a different layout.

If you're lucky, you'll have people lined up to help produce the publication. The program makes allowances for a staff of contributing writers, editors, and artists. Using a modem, art and copy can be sent or received by anybody using *The Newsroom* and a Commodore 64/128, Apple II-series, or IBM PC computer. Evidentally, copy from other word processors can't be uploaded because the program transmits graphics characters rather than ASCII character codes.

The final publication is assembled in the Layout work area. Here you arrange the panels prepared at the Copy Desk and the banner into full pages, which can be either letter-size (8½ × 11 inches) or legal-size (8½ × 14 inches). Anywhere from six to ten panels can fit on a page depending on the size and whether or not you have a banner. The copy is in two-column format, excluding the banner which runs across the top of the page. You're virtually finished once layout is set; you simply print the pages out. That should be no problem given the impressive list of printers and interfaces the program has allowed for. Try using a new ribbon in your printer when you use this program because the single-impact dot-matrix screen dump tends to be light. You'll want a sharp, dark copy for good reproducibility.

For all the timesaving features *The Newsroom* offers, I do have some doubts. My main reservation is the look

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of the screen dump: The leading (spacing between the lines) of the small typeface is too tight. I think it's hard to read. And the typefaces themselves appear squatty and cramped. Others who have seen *The Newsroom's* output disagree with me, so judge for yourself. A lesser complaint, I find the disk-swapping somewhat tiresome. Also, when you're typing in copy, the cursor tends to lag behind the keystrokes a bit.

The Newsroom is not meant to compete with professional typesetting and pasteup design. For the money, the program can produce a respectable publication of near-professional quality. After using it, going back to scissors and tape is unthinkable.

—*Gail Cowper*

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Stickybear: Reading, Spelling, And Math

If parenthood holds one main sobering realization, it's that you don't really know what your children like. Just before Cabbage Patch dolls took off, my wife and I stood by a tall stack of them and smugly noted that our kids would find them repulsive; two days before Christmas we hired someone to get us two at any cost (we failed). The following Christmas, I gave them some software I was certain they would treasure; it remains unplayed, except by me. This year I gave Weekly Reader Family Software's *Stickybear Math* as a last-minute, fill-in birthday gift for Michelle, my six-year old. Good father that I am, I had tested it beforehand, and I thought it fair, but uninspiring. Predictably, Michelle loved it. *Stickybear Reading* and *Stickybear Spellgrabber* soon followed, and she and her class have become Stickybear fanatics.

To me, a jaded grown-up expecting more and better things from the software I buy, the Stickybear series seems quite ordinary. To Michelle and her sister Catherine, however, it is a world of marvels. They like the fact that it helps them in school. (That surprised me). They like the fact that it makes them think hard. (That, too). And they like the fact that it does not seek to dazzle them. I've always read that children suffer from repetition, that they learn best when the learning is hidden from them. After seeing Stickybear, I now read different books.

The Stickybear series, available for the Commodore 64, is designed around a family of animated bears. Its purpose is clearly educational; its philosophy is learning through enjoyable drill and practice. *Stickybear Math*, for instance, opens its manual by saying that the program "is designed to provide focused drill and practice in basic addition and subtraction skills for children ages six through nine." *Stickybear Reading* "introduces language elements to children ages five through eight." *Stickybear Spellgrabber*'s intention is "to capture the interest of beginning spellers and motivate them to improve their spelling skills." I quote these to demonstrate the educational priority of the programs, and because without them we cannot really assess the software's effectiveness.

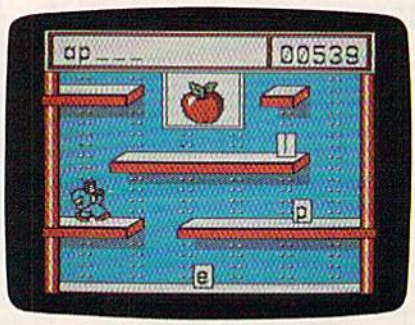
Stickybear Reading contains three games: Match the Words, Find the Word, and Build a Sentence. Match the Words displays three pictures down the left side of the screen, with three corresponding nouns in jumbled order down the right. The child draws a line between the picture and its word. When she gets them right, Stickybear zips across the screen; if wrong, she gets to try again. Find the Word shows a sentence with a missing word, a list of three possible words to put in the blank, and an animated picture depicting the sentence. For example, the sentence might read, "The (plane, sheep, box) flies over the turtle," while the picture shows an airplane flying over a turtle. The child fills in the blank. Build a Sentence, logically extending the first two games, has the child select a subject, a predicate, and an object from a list showing three of each. Once she has done so, the program will animate the sentence. For example, if she chooses *Stickybear* for the subject, *bounces past* for the predicate, and *a chicken* for the object, the screen will display Stickybear bouncing past a chicken.

Stickybear Spellgrabber also contains three games. Picture Spell shows a picture of an object, with the letters of the word scattered about on "ledges." With a joystick, the child directs Stickybear to pick up the letters in the right order. Stickybear jumps from ledge to ledge, and sometimes must catch the letters in mid-air. Word Spell is almost identical, but it dispenses with the picture. Bear Dunk is quite different, a variation of Hangman. The child (or children—two can play) must figure out the letters of a mystery word; if she fails, Stickybear falls into a tub of water. *Stickybear Spellgrabber* is the only one of the three products that uses joystick skills and a points system. It can be edited, so that new word lists may be added.

Michelle received *Stickybear Reading* first and then *Stickybear Spellgrabber*. As she and Catherine played them, I loosed my analytical mind, until finally I was certain why they liked them so much. *Stickybear Reading* captured them with its charming animations; *Stickybear Spellgrabber* with its solid game qualities and the allure of points to score. Smiling to myself, I watched them fire up *Stickybear Math*, which has little animation and no game at all. The game, I knew, would bear out my theory, and I would complete my review easily.

Oh, well.

More than either of the other two products, *Stickybear Math* grabbed and held their interest. Its goals are simple: to teach by repetition and drill. Ostensibly, the child is trying to help Stickybear get over a wall, or off a building, or across a pond, by answering addition and subtraction questions. When the



Stickybear Spellgrabber

child answers correctly, the screen animates; five correct answers, and Stickybear moves a little closer to his destination. For Catherine and Michelle, though, the pictures held less interest than the problems. They liked adding and subtracting on the computer. This is not to say that the pictures meant nothing to them; they've played other drill-based math games and found them boring. For whatever reasons, *Stickybear Math* does it properly.

The program is quite sophisticated. Parents can prescribe the types of questions that will be asked, choosing among addition, subtraction, column addition, missing or multiple addends, and so on. There is even a report card (which the girls found thrilling), displaying the level the child started and ended the session, and the number of right and wrong answers. The report card is saved to disk under the child's name. The disk will hold files for 24 children. Twenty levels are available. Level One is "addition with animated objects shown, sums to 5, horizontal and vertical presentation." Level 20

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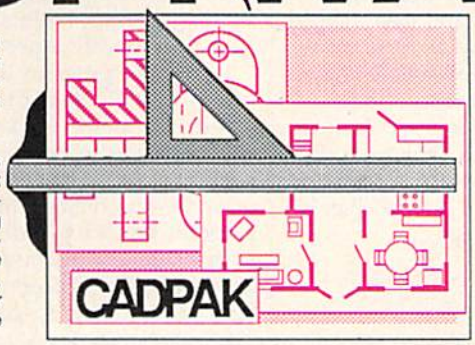

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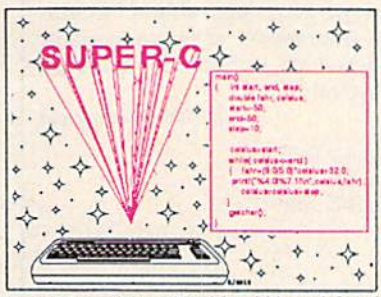

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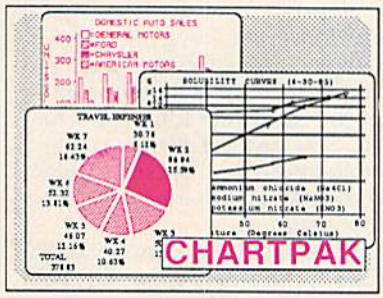

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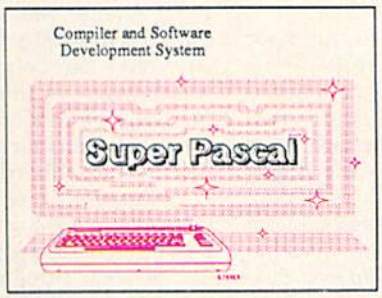

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has, among other features, "Three-place subtraction with borrow, vertical presentation." The levels automatically adjust as the child plays.

Weekly Reader Family Software has produced a fine series of educational games. The Stickybear products have provided my daughters with hours of enjoyable instruction, and have helped them in school. Almost as importantly, they have reinforced for me the knowledge that judging the tastes of others—especially children—is very difficult. For both parents and reviewers, this knowledge is indispensable.

—Neil Randall

Weekly Reader Family Software
245 Long Hill Road
Middletown, CT 06457
$29.95 each (disk)

Algorhythmic Composer

With the advent of MIDI—the interface standard for electronic music—all kinds of machines can communicate and, thus, make music together. And, with the addition of an interface, your Commodore 64 can act as the brains and bandleader of the whole group. Any electronic keyboard, effects device (echo, reverb, etc.), or drum machine which has MIDI can be driven by a variety of available 64 programs through a 64-to-MIDI interface.

The 64 can be a cost-effective, efficient musical supervisor, and several companies currently offer software which transforms the computer into a magnificent music machine. Among the most intriguing new software is a set of programs from Dr.T's Music Software which allow your 64 to compose music. This recently released package contains several distinct music generating routines. The Phrase Generator, for example, is designed "to generate new types of sequences which a person's habitual musical thought processes might not invent, and as a stimulant to remove creative blocks."

The user first sets up a particular scale structure which will govern the possible notes and, thereby, the tonality of the phrase. Then the rhythmic structure is defined. Finally, randomness is introduced as the computer constructs the finished phrase working within the limits established by the user. Variations on the theme can be produced as the user switches to another scale or the computer rearranges the notes within the predefined scale. At any point, the results can be listened to or stored to disk for later use with Dr. T's Sequencer.

Other user-defined variables include "Rest Probability," which governs the randomness with which pauses are introduced, and "Harmonicity Factor," which determines the likelihood that a particular scale position will appear in a generated theme. You can favor consonance, increase harmony for longer notes, build arpeggiation effects, and modify aspects of velocity.

Another program in this package, the Stochastic Algorithm Composer (SAC), represents a completely different approach to computer-generated music. *Stochastic* means that something depends on chance. Interestingly, the program utilizes two different random number generators: a skewed one for generating the different pitches and a fully random one to govern duration. The user can control a variety of factors including tempo, phrase repetition, and whether or not a theme will change as the piece progresses.

The program generates four-part harmonies. There are several menu screens and you step between them to predetermine various factors affecting the final musical product. The individual voices can be transposed, velocity (the amount of initial attack on each note) can be randomized, and you can select between four pitch tables or modify the tables directly.

A separate menu allows you to influence somewhat the rhythm of each part by providing a list of duration values or rests from which the random number algorithm will select note time values. Each of the four parts can be predefined as legato or staccato. The final menu permits selection of individual MIDI channels for each part and enable repeat mode (and determine the duration of the theme). This menu also offers the programmer a setting which will "permutate" the melody (change it slightly on each repetition), and you can also define the probability that permutation will occur at all. Saving and loading setups from disk are supported, and you can scramble the random seed whenever you wish, even in PLAY mode.

Overall, the resulting music from both the SAC and the Phrase Generator programs is, as you might expect, variable. It's as if you are auditioning hopeful composers and you listen to a variety of pieces—ranging from awful to inspired—as the computer generates a constantly varying series of musical events. It's not that you'll simply be choosing the pieces that harmonize (everything will harmonize unless you set up a dissonant scale). It's more a question of picking those selections wherein the melody seems worthy, the rhythm supports the melodic line and, most of all, the entire piece seems apt, seems to have musical value. Of course you can always load the dice by selecting a scale which is likely to result in a blues bass line or a rock riff.

Experiments here confirmed that the *Algorhythmic Composer* achieves its goals admirably. It offers the musician continually varying musical ideas and, although initial parameters are user-defined, the results are frequently surprising and clearly not something the user would have invented unassisted by the machine.

The idea of random music generation brings to mind that old literary anecdote: With enough time and enough monkeys typing, one of them will eventually write *Hamlet*. Listening to the products of the *Algorhythmic Composer*, we were never pleasantly startled to hear a Bach fugue come pouring out of the synthesizer. However, one of the four-part computer inventions was notably lovely and musically intelligent. The computer permutated it into degenerate variations, but, because any results can be saved to disk, you can extract the good phrases from the bad. Using the various facilities of the sequencer, we were later able to orchestrate an impressive, coherent piece of music based on a theme invented by the Commodore 64.

—Richard Mansfield

Dr. T's Music Software
66 Louise Rd.
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$100

Elidon

Does the prospect of turning into a faerie and setting off on a lengthy quest in pursuit of mysterious but highly essential elixirs appeal to you? If that's not to your taste, how about a chance to win some not-so-mysterious, but still highly essential money? In either case, *Elidon* may be for you.

The painless elfin metamorphosis is the basis for this new game for the Commodore 64. And Orpheus, the publishers of *Elidon*, provides the prize money for the first three people who solve the software's built-in puzzle.

The money is a nice inducement, but it's probably not necessary for those with a whimsical turn of mind and a burning ambition to ensure that the proper floral headgear appears atop the tresses of the Queen of the Faeries at the spring ball. Collecting flowers for the monarch's fragrant crown is the ultimate goal of *Elidon*, but it's a task that's neither trivial nor easy.

The faerie world consists of about 300 rooms. These have widely varied characteristics, ranging from forest clearing to dank dungeon. If you dare to

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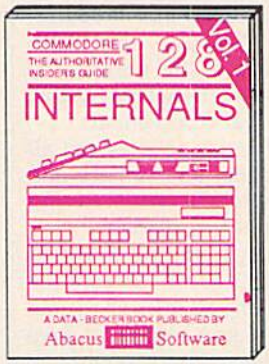

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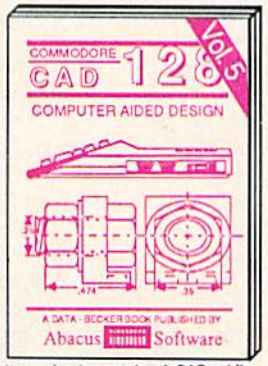

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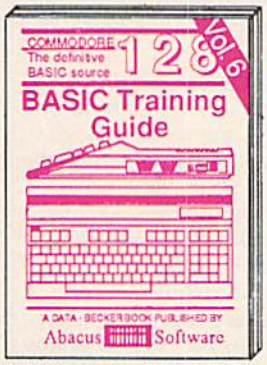

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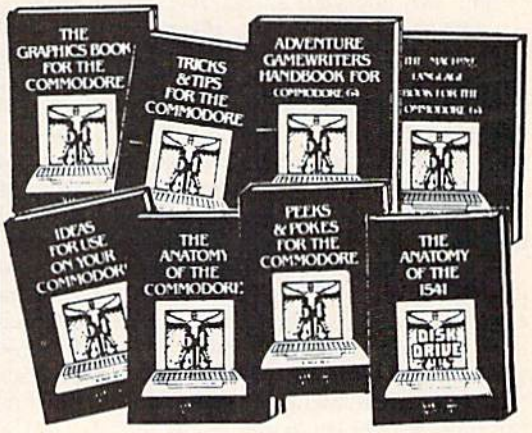
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venture into them, you'll encounter some quite beautiful flora, and also meet the dangerous, dimly perceived entities that pass for fauna in the strange sylvan environment. As your delicate gossamer wings carry you about, you'll find it necessary to restore your vigor from time to time with a refreshing draught of sparkling fairy dust. This is not always easily found or ingested.

However, should you run low on dust, your mystic energies will fail, your wings fade, and the power of flight depart. You'll shortly regenerate another pair of wings, but you'll have lost one of your four faerie lives. And you'll probably need every break you can get in order to complete your botanical investigations, for it seems that faerie energy is in great demand in the realm of Elidon. Various airborn lifeforms pursue you as you go, and even momentary contact means serious energy loss for you. But not all your enemies are of the aerial persuasion. Some, in fact, inhabit deep, Stygian chambers. These beings are very large; you can see only their eyes, but their hulking, invisible bodies often impede your progress. And, of course, even the passage of time eats into your energy reserves.

Further, many of the plants act against you. Often, the most beautiful are the most harmful, some seeming to induce an almost unbreakable disorientation in the elfin guidance system. And, unfortunately, none of the potions you're likely to discover appears to be the calamine lotion you need to fight the poison plants.

I shouldn't forget to mention that just plain, clumsy flying earns its own dismal reward. Crashing into a sky island or other obstacle means a fall—sometimes an almost endless fall into the very nether reaches of Elidon. You can only recover the power of flight or hovering when your descent is broken by a horizontal surface. And that inevitably leads to a long, energy-dissipating climb back to where you thought you knew what you were doing.

And that brings up the subject of Elidonography. It's a large and trackless world, but unless your quest is imbued with a certain intelligence, it's doomed to failure. Although elves would never stoop to such human artifice, a map jotted down on a scrap of paper might not go amiss. (But then again, it might.) New passages are constantly opening and closing: Only an elfin lightness of spirit will prevail in this twisting, shifting world.

However, energy conservation and geography are the least of your problems. You don't know what you're looking for or how to find it. There are no clues in *Elidon*'s documentation—it's a puzzle, a mystery without the customary courtesies. On the other antenna, you'll find and collect interesting objects that may eventually prove useful and informative, but only if you possess the power needed to dispel the thick fog that clouds their names and natures. Happily, the game is easy to play, and to make progress in, but the final goal is elusive enough to provide a long-term challenge.

Elidon is other-worldly and positively radiates charm. It's a fine piece of software, and rates a look from anybody already attempting another difficult quest: the search for a gentle and dreamlike computer game.

—Lee Noel, Jr.

Orpheus
Box 333, Elmira
Ontario, Canada N3B 2Z7
$22.50 (disk or tape)

Europe Ablaze

Plan a weekend in which you'll gather a group of friends—and prepare to experience what may well be the ultimate aerial warfare computer game. *Europe Ablaze*, based on World War II air combat, is, in my opinion, possibly the best war game available for any home computer. It's the sequel to *Carriers At War* (reviewed in the November 1985 issue), and is published by the Australian-based Strategic Studies Group for several computers, including the Commodore 64, the version reviewed here. *Europe Ablaze* is not for the arcade champ: Quick reflexes and good hand-eye coordination won't earn any points in this game. But cool thinking under pressure and the ability to plan and execute a careful strategy do have their rewards.

Unlike most strategy war games, which pit you against the computer or, at best, against one opponent, roles for up to nine people are available in the various game scenerios included with the master disk. It's even possible to set up your own scenerios with up to 12 participants after you become familiar with the game.

You'll enjoy it most by beginning with one of the preprogrammed scenarios. Select "Their Finest Hour" and participate in the Battle of Britain, the struggle for domination of the air over the English Channel.

In "Enemy Coast Ahead," you'll be involved in the strikes by the RAF Bomber Command against Germany.

The last choice is "Piercing the Reich," as the 8th Air Force hammers the final blows against the Luftwaffe in the Battle of Berlin.

You may select to serve as the commander-in-chief of either the Allied Forces or the Axis Powers. You receive your instructions from the Supreme Command and pass orders to the forces under your command. Your friends can then fill the other roles in each scenario, or the computer can be assigned to fill any roles not assigned to human players.

Or you can serve as a group commander and allow the computer to fill all other roles for your side, as well as controlling the opposing forces. If you want to experience the total aerial war effort, fill all the roles of one side yourself, and assign the computer to control your adversary. Of course, the multitude of decisions and the missions to track could easily overwhelm you, just as they would a real commander.

Yet another option is to assign all roles to the computer and sit back and watch. (Surprisingly, the results are not always the same in this mode.)

Don't plan on spending one evening with *Europe Ablaze*. Even with the computer controlling all roles, the game can run for more than 12 hours. A Save option is available, and necessary if you plan to play a game to completion. It's possible to end a game in the middle of a scenario and determine a victor from the points earned in combat, but this isn't nearly as satisfying as having completed the scenerio.

Most war game simulations are very complicated. Usually, the more complex the game, the more difficult it is to play. *Europe Ablaze* is extremely complex. (It has to be to allow up to 12 players at once.) Even so, the user interface has been well thought out. You'll find communication with the program to be almost second nature.

All selections are made from easy-to-understand menus. The player's manual explains everything in detail. Even beginning war gamers will be able to understand and enjoy *Europe Ablaze*. On the other hand, the level of complexity will be satisfying for even the most experienced war gamers. You can make mistakes, but not because you couldn't find information or you didn't understand what to do next.

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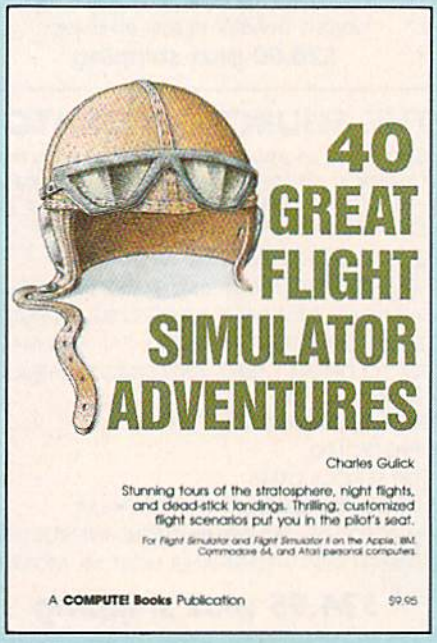
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As with the game itself, you create your own scenario through a series of menus. A detailed, easy-to-understand design manual is included with the package. Creating your own scenario isn't difficult, but it's best to play those included on the master disk for a while to get the feel of the game.

—*George Miller*

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also worth noting

SkiWriter

More than a year and a half ago, Ken Skier created a software package that was half word processor and half telecommunications program, called *SkiWriter II*. The $69.95 program, originally marketed by Prentice-Hall Home Software, went into limbo when Prentice-Hall withdrew from the home software market. Now, however, Mastertronic has released the *SkiWriter* word processor, without telecommunications program, for $15.

Those familiar with the original *SkiWriter* will remember that the program is menu-driven, easy to use, and contains all of the features you'd expect from a good word processor. The Main Menu offers you a list of options: Edit, Preview, Print, File, and Quit. The f1 function key provides a help menu with options for new users, typing/editing, formatting, previewing, printing, cassette filing, and disk filing. *SkiWriter*'s ease of use and the many help screens eliminate the need for an extensive manual; a three-page introduction sheet will get you started immediately. Also provided in the package are two function key overlays, one for the 64 and one for the 128 (to be used in 64 mode).

Standard features include automatic word wrap; auto reformatting; onscreen underlining; line justification; block copying, moving, and deleting; and much more.

SkiWriter is configured to work immediately with the Commodore MPS-801 printer (and MPS-803, although this printer is not mentioned in the onscreen documentation), or by a simple menu change, it works with the MPS-802, 1525, or 1526 printer. By following a short series of onscreen directions and consulting your printer manual, *SkiWriter* can easily be configured to support any printer working with any interface. You can even take advantage of your printer's special features, such as boldface or italics printing.

By the time you read this, Mastertronic will also have a Commodore 128 *SkiWriter* available that takes advantage of the 128's 80-columns and extra memory, for a comparably low price. Even if you're currently using another word processor, *SkiWriter's* power, ease of use, and price make it a genuine bargain.

Mastertronic International, Inc.
7311B Grove Road
Frederick, MD 21701
$15 (disk)

Firebird's "Flippies"

Superb graphics, interesting game play, and budget prices combine to create a choice series of computer entertainment packages from Firebird Software for Commodore 64 and 128 users. Firebird's "Silver Series" games, all of which have been bestsellers in the United Kingdom, have been repackaged for U.S. distribution. The best part of the deal is that two games are placed on each disk (one game on either side of the floppy, or "flippy"), with the resulting package priced at only $19.95—in other words, $10 per game.

Packages in the series that are currently available now include; *Underwurlde* and *Sabre Wulf*, three-dimensional graphics adventures—both on one disk. *Booty*, an arcade type game, is combined with *Cylu*, another adventure with 3-D graphics. Finally *Willow Pattern*, a graphics adventure, is teamed with *Chimera*, a 3-D graphic adventure.

All of the products feature graphics as near arcade quality as any we've seen for a home computer, and excellent use of sound. It's easy to see why these games have been so popular abroad.

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First introduced at the 1985 Summer Consumer Electronics Show in a version for the Macintosh, *The Great International Paper Airplane Construction Kit* includes a disk with the program, designs for everything from a biplane to the Space Shuttle, plus other designs to customize your creations. In order to design and customize your paper airplanes, you'll need a Koala Pad or similar graphics tablet and a paint program, although the ready-made designs on the disk can be used with just your 64, a disk drive, and most Commodore-compatible printers.

Simon and Schuster, Inc.
1230 Avenue of the Americas
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Grover's Animal Adventures

Grover steps out of Sesame Street and into the colorful outdoors in *Grover's Animal Adventures*, a new game for children ages four to six, from CBS Software. The game begins with a choice of four enticing environments: the African grasslands, the Atlantic Ocean, a North American forest, and a barnyard. Within each environment there are land, water, sky, an animated Grover, and a wide variety of animals and natural objects to choose from.

As each animal or object appears on the screen, its name is printed beneath it. Using the joystick and an easy-to-read template which fits over the function keys, the animals and objects can be placed within the environment. If an animal is placed in an inappropriate place—say, a giraffe in a tree—it will blink until it's moved.

Perhaps the most charming feature of *Grover's Animal Adventures* is its animation. Each animal has a unique way of walking, swimming, or flying across the screen. Grover can be walked around as well. *Grover's Animal Adventures* should meet with success among preschoolers in that it teaches animal classification and word recognition in a playful, visually appealing, and completely non-competitive way.

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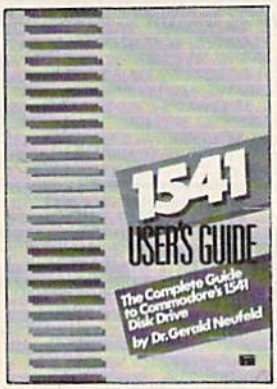

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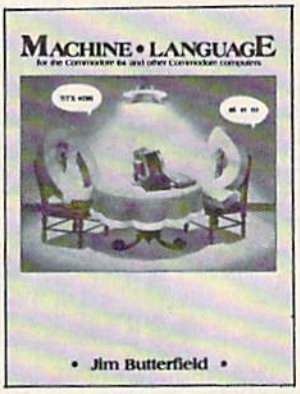

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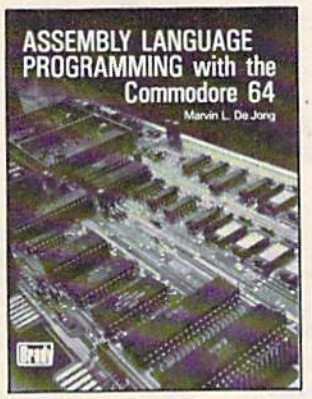

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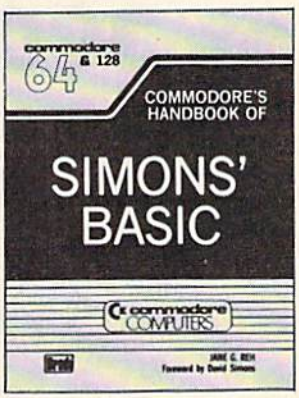

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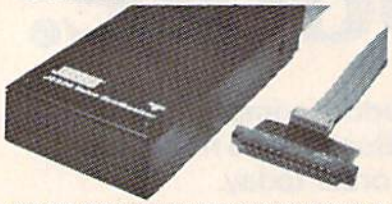

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A Guide To Commodore User Groups

Part 1

Joan Rouleau

This user group guide continues next month with Part 2 (states N–W and countries outside the U.S.). When writing to a user group for information, please remember to enclose a stamped, self-addressed envelope.

User groups are listed within each state by zip code in ascending order.

ALABAMA

Commodore Club South, Inc., P.O. Box 324, Birmingham, AL 35126

Birmingham Commodore Computer Club, P.O. Box 59564, Birmingham, AL 35259

Crimson Tide Users Group (CTUG), 3722 37th St. E, Tuscaloosa, AL 35405

Valley Commodore Users Group (VCUG), P.O. Box 835, Decatur, AL 35602-0835

Shoals Commodore User Group, 114 Van Fleet Dr., Florence, AL 35630

Scottsboro Commodore 64 Users Group, Rt. 5, Box 255, Scottsboro, AL 35768

Huntsville Alabama Commodore Komputer Society (HACKS), P.O. Box 14356, Huntsville, AL 35815

Sequoyah Users Group (SUG), 2301 Godfrey Ave. NE, Lot 4, Ft. Payne, AL 35967

Montgomery Area Commodore Komputer Society (MACKS), P.O. Box 210126, Montgomery, AL 36121-0126

East Alabama Users' Group, P.O. Box 249, Jacksonville, AL 36265

WireGrass Micro-Computer Society, 104 Ridgedale Dr., Dothan AL 36301; or, 109 Key Bend Rd., Enterprise, AL 36301

Amiga/Commodore Club of Mobile, 3868-H Rue Maison, Mobile, AL 36608

ALASKA

Anchorage Commodore Users, P.O.Box 104615, Anchorage, AK 99510-4615 99708

Latitude 64, P.O. Box 80587, Fairbanks, AK 99708

Sitka Commodore User's Group, P.O. Box 2204, Sitka, AK 99835

First City Users Group, Box 6002, Ketchikan, AK 99901

ARIZONA

The Stone 64 Users Group, P.O. Box 301, Reyno, AZ 72462

The Unknown Users, P.O. Box 1471, Phoenix, AZ 85001

Commodore User Group of Arizona, P.O. Box 21291, Phoenix, AZ 85036

Arizona VIC and 64 Users, 904 W. Marlboro Circle, Chandler, AZ 85224

COmmodore Users Group of ARizona (COUGAR Inc.), 1820 W. Village Way, Tempe, AZ 85282

Gila Hackers, Route 1, Box 34, Globe, AZ 85501

Catalina Commodore Computer Club, Inc, P.O. Box 32548, Tucson, AZ 85751

Prescott Area Commodore Club, 1631 N. Canfield Ave., Chino Valley, AZ 86323

Canyon De Chelly-Four Corners Users Group, c/o Calumet Consulting, Box 1945, Chinle, AZ 86503

ARKANSAS

Commodore Computer Club of Pine Bluff, P.O. Box 1083, Pine Bluff, AR 71603

The Southwest Arkansas Commodore Users Group, 404 S. Greening St., Hope, AR 71801

Conway County Computer Users Group, Rt. 2, Box 69, Morrilton, AR 72110

River City Commodore Club, P.O. Box 4298, N. Little Rock, AR 72116

Arkansas 64 Trading Post, P.O. Box 135, Biggers, AR 72413

The Personal Touch Commodore User Group of Hoxie and Walnut Ridge, 503 Kaylynn Dr., Walnut Ridge, AR 72476

Harrison Users Group, Rt. 1, Box 15, Harrison, AR 72601

Fayetteville Commodore User's Group, P.O. Box 931, Gravette, AR 72736

Russellville Commodore Users Group, P.O. Box 1327, Russellville, AR 72801

Ark-La-Tex Commodore Users Exchange (CUE), P.O. Box 6473, Texarkana, AR-TX 75503

CALIFORNIA

Hollywood Commodore 64 User Group, 733 N. Ridgewood Place, Hollywood, CA 90038

South Bay Commodore Users Group (SBCUG) (suburban L.A.), P.O. Box 356, Manhattan Beach, CA 90266

Commodore 64 West Users Club (West L.A. and Santa Monica), P.O. Box 406, Santa Monica, CA 90406-0406

Power Surge, 7660 Western Ave., Buena Park, CA 90620

West Orange County Commodore Users Group, P.O. Box 6441, Buena Park, CA 90622

CLUB64, P.O. Box 3116, Bellflower, CA 90706

Commodore Helpers, 3736 Myrtle Ave., Long Beach, CA 90807

Pasadena Commodore Computer Club, P.O. Box 1163, Arcadia, CA 91006

Librascope Computer Club, 833 Sonora Ave., Glendale, CA 91201

West Valley Commodore Users Group, President, 23455 Justice St., Canoga Park, CA 91306

San Fernando Valley Commodore User Group (SFVCUG), 21208 Nashville, Chatsworth, CA 91311

Cal Poly Commodore Users' Group, 14617 1/2 Ramona Blvd., Baldwin Park, CA 91706

California Area Commodore Terminal User Society (CACTUS), P.O. Box 1277, Alta Loma, CA 91701

South Bay Commodore 64 Users Group, P.O. Box 1899, Chula Vista, CA 92012-1899

Oceana-64 Commodore User Group, 1004 Plover Way, Oceanside, CA 92056

Back-Country Commodore Club, 617 16th St., Ramona, CA 92065

General Dynamics Commodore Computer Club, General Dynamics/ Electronics Division, P.O. Box 85310, MZ7134G, San Diego, CA 92138-5310

San Diego Commodore Users Group, P.O. Box 86531, San Diego, CA 92138

Lowest Users Group in the United States (LUGITUS), 650 S. Imperial Ave., Brawley, CA 92227

San Bernardino Commodore 64 Club, P.O. Box 514, Patton, CA 92369-0514

Commodore User Group, 24285 Sunnymead Blvd., #157, Sunnymead, CA 92388

C-TUG Orange County, c/o Syntax Error, P.O. Box 8051, Orange, CA 92664

South Orange County User Group, 2314 Monte Cristo, San Clemente, CA 92672

Southern Orange County Commodore Komputer Services Group (SOCCKS), The Wizard's Exchange, 26421 Avenida Deseo, Mission Viejo, CA 92691

The 20/64 Group, 2170 W. Broadway, Suite 529, Anaheim, CA 92804-2446

64/20 Club, 6464 Shearwater St., Ventura, CA 93003

CIVIC64, c/o Box 667, Camarillo, CA 93011

Civic64 User Group, P.O. Box 2442, Oxnard, CA 93034-2442

A Bakersfield Area Commodore Users Society (ABACUS), 3101 Oakridge Dr., Bakersfield, CA 93306

Cal Poly Commodore Computer Users Group, Activities Planning Center, Box 121, California Polytechnic State University, San Luis Obispo, CA 93407

San Luis Obispo Commodore Computer Club, 1766 9th St., Los Osos, CA 93402

Simply Users of Computers Combining Experience for Strength and Success, 301 Veronica Dr., Paso Robles, CA 93446

Central Coast Commodore Users Group, 4237 Plumeria Ct., Santa Maria, CA 93455

Madera Users Group (MUG), P.O. Box 783, Madera, CA 93639

FCUG/SixtyFourum, P.O. Box 16098, Fresno, CA 93755

PLUG (Plus/4 Users' Group), Box 1001, Monterey, CA 93942

Monterey Peninsula Commodore Group, P.O. Box 2105, Seaside, CA 93955
First Amiga User Group, 549 Old County Rd., San Carlos, CA 94070
Peninsula Commodore User Group, 549 Old County Rd., San Carlos, CA 94070
Lowell High School Commodore 64 Users' Group, 2206-26th Ave., San Francisco, CA 94116
San Francisco Commodore Users Group, 278 27th Ave. #103, San Francisco, CA 94121
VISIONS-64, P.O. Box 26638, San Francisco, CA 94126
PET-On-The-Air, 525 Crestlake Dr., San Francisco, CA 94132
Concord Area Commodore Enthusiasts (CACE), 4861 Boxer Blvd., Concord, CA 94521
Diablo Valley Commodore User Group, P.O. Box 27155, Concord, CA 94527
DUG (Danville User Group), 185 Front St., Suite 106, Danville, CA 94526
Fremont, Union City, Newark, Hayward Users Group (FUNHUG), 36015 Pizarro Dr., Fremont, CA 94536
Sphinx Commodore Users Group, 22091 Young Ave., Castro Valley, CA 94546
Amiga & Commodore Computer Enthusiasts Society (ACCESS), 5870 Singing Hills, Ave., Livermore, CA 94550
Napa Valley Commodore Computer Club, P.O. Box 2324, Napa, CA 94558
Pleasanton User Group (PUG), 3120 Cranwood Ct., Pleasanton, CA 94566
Marin Commodore Computer Club, 665 Las Colindas Rd., San Rafael, CA 94903
Commodore Owners of Petaluma (COOP), P.O. Box 5054, Petaluma, CA 94953
PUG of the Silicon Valley, 22355 Rancho Ventura St., Cupertino, CA 95014
Commodore Users Group of Santa Cruz, P.O. Box 8068, Santa Cruz, CA 95061-8068
Commodore Twenty/Sixty-Four User Group, P.O. Box 26811, San Jose, CA 95159-6811
Stockton Commodore User's Group, 2929 Calariva Dr., Stockton, CA 95204
Valley Computer Club, P.O. Box 310, Denair, CA 95316
The Central California Commodore Computer Club (C-5), 3440 De Anza Ave., Merced, CA 95340
Santa Rosa Commodore 64 User Group, 333 E. Robles Ave., Santa Rosa, CA 95407-7971
Amateurs and Artesians Computing, P.O. Box 682, c/o Alex KR6G, Cobb Mountain, CA 95426
Computer Users Group of Ukiah (CUGU), 9500 West Rd., Potter Valley, CA 95469
Auburn Commodore Computer Club, P.O. Box 4270, Auburn, CA 95604
Fairfield Commodore User's Group, 200 Cambridge Dr., Vacaville, CA 95688
Vacaville Commodore Users Group (VCUG), 530 Burlington Dr., Vacaville, CA 95688
High Sierra 20/64, P.O. Box 8110, S. Lake Tahoe, CA 95731
Sacramento Commodore Computer Club, P.O. Box 13393, Sacramento, CA 95813-3393
North Valley Commodore User's Group, P.O. Box 1925, Chico, CA 95927

COLORADO

Colorado Pet Users Group (CPUG), 676 S. Quentin St., Aurora, CO 80012
Colorado Commodore Computer Club, 64 Mountain Shadows Lane, Castle Rock, CO 80104
Commodore Condor Club, 1680 Lewis St., Lakewood, CO 80215
VDUG Users Group, 326 Emery Dr., Longmont, CO 80501
Ft. Collins C³, 1625 Centennial Rd., Ft. Collins, CO 80525
The Commodore Club, 4058 Baytown Dr, Colorado Springs, CO 80916
The Local Folks Computer Club, 1653-130 Rd., Glenwood Springs, CO 81601
Rocky Mountain Commodore Club, P.O. Box 377, Aspen, CO 81612

CONNECTICUT

Bristol Commodore Users Group (BCUG), 38 Mine Rd., Burlington, CT 06013
Capital Region Commodore Computer Club (CRCCC), P.O. Box 2372, Vernon, CT 06066
Hartford County Commodore Users Group, Inc., P.O. Box 8553, East Hartford, CT 06108
Millstone Users Group-C64, NNECO Trng. Bldg., Box 128, Waterford, CT 06385
Interface 64, Plains Rd., Haddam, CT 06438
Computer Users Group, 6 Saner Rd., Marlborough, CT 06447
Greater New Haven Commodore User Group, P.O. Box 796, North Haven, CT 06473
Commodore 64 User Group, 1070 S. Colony Rd., Wallingford, CT 06492
Commodore Users Group of Stratford, P.O. Box 1213, Stratford, CT 06497
The Naugatuck Valley Commodore Users Group, 28 Ray St., Waterbury, CT 06708
Fairfield County Commodore User Group, P.O. Box 212, Danbury, CT 06810
Stamford Area Commodore Society (SACS), P.O. Box 2122, Stamford, CT 06906-0122

DELAWARE

Newark Commodore Users Group (NCUG), 210 Durso Dr., Newark, DE 19711
The Brandywine Users Group (BUG), 157 Starr Rd., Newark, DE 19711
Tri-State User Group, 2312 Carpenter Rd., Wilmington, DE 19810
Diamond State User Group, Box 892, Rt. 2, Felton, DE 19943
Lower Delaware Commodore Computer Club (LDCCC), P.O Box 882, Rehoboth Beach, DE 19971

DISTRICT OF COLUMBIA

NAVAIR Commodore User Group, Naval Air Sys Command Rec. Assn., Washington, DC 20361
Navy Micro User Group, c/o Clyde Williams, NAVDAC CODE 91, Washington, DC 20374
Edison Commodore User Group, Naval Research Lab., Code 7754, Washington, DC 20735

FLORIDA

Public Domain Users Group, P.O. Box 1442, Orange Park, FL 32067
Commodore Computer Club, P.O. Box 60514, Jacksonville, FL 32236-0514
Commodore Users Group at Tallahassee, P.O. Box 14015, Tallahassee, FL 32317
Bay Commodore Users' Group, P.O. Box 3187, Panama City, FL 32401
Commodore Users Group of Pensacola, P.O. Box 3533, Pensacola, FL 32516
The Commodore Advantage, P.O. Box 18490, Pensacola, FL 32523
Fort Walton Beach Commodore Users Group, P.O. Box 3, Shalimar, FL 32579
Gainesville Commodore Users Group, Santa Fe Community College, P.O. Drawer 1530, Gainesville, FL 32602
Gainesville Commodore User Group, P.O. Box 14716, Gainesville, FL 32604-4716
Citrus Co. Commodore Users Group, P.O. Box 503, Beverly Hills, FL 32665
Tri-County Commodore Users Group, P.O. Box 1151, Ocala, FL 32678
Lake Sumter Commodore Users Group (LSCUG), P.O. Box 416, Leesburg, FL 32748
Lake County Commodore Club, P.O. Box 326, Tavares, FL 32778
Titusville Commodore Club, 890 Alford St., Titusville, FL 32796
64 Society, 4071 Edgewater Dr., Orlando, FL 32804
The Central Florida Commodore User's Club, Inc., P.O. Box 7326, Orlando, FL 32854
El Shift OH, P.O. 361348, Melbourne, FL 32936-1348
Miami 64 User Group, P.O. Box 561689, Miami, FL 33256
Gold Coast Commodore Group (GCCG), P.O. Box 375, Deerfield Beach, FL 33441
Mana Sota Commodore Users Group (MSCUG), 916 E. 35th Ave, Bradenton, FL 33508
Brandon Users Group, P.O. Box 351, Brandon, FL 33511
Commodore Brooksville User Group (C-BUG), P.O. Box 1261, Brooksville, FL 33512
Clearwater Commodore Club, P.O. Box 11211, Clearwater, FL 33516
Bits and Bytes Computer Club, 1859 Neptune Dr., Englewood, FL 33533
Suncoast Bytes Commodore Computer Club, 801 Pine St., New Port Richey, FL 33552
C.I.P.E. 64/128 Commodore User Group, 730 Pincherry Ln., Port Richey, FL 33568
Commodore Computer Club, P.O. Box 21138, St. Petersburg, FL 33742
Chips User Group, P.O. Box 142, Avon Park, FL 33825
Commodore Users Group of SW Florida, P.O. Box 6399, Ft. Myers, FL 33911
Charlotte County Commodore Club (CCCC), P.O. Box 512103, Punta Gorda, FL 33951-2103
SUNCOAST 64s, P.O. Box 6628, Ozona, FL 34265-6628
Gulf Coast Computer Club, P.O. Box 1104, Port Richey, FL 34288-1104
Ram Rom 84, P.O. Box 1369, Englewood, FL 34295-1369

GEORGIA

Clayton County C-64 Users Group, 6379 Bimini Dr., Forest Park GA 30050
Griffin Commodore Program Exchange (GCPE), 1820 Hallmark Dr., Griffin, GA 30223
Stone Mountain Users Group (SMUG 64/128), P.O. Box 1762, Lilburn, GA 30247
CCC64UG, P.O. Box 842, Morrow, GA 30260
Covington C-64 User Group, P.O. Box 642, Oxford, GA 30267
Commodore's Telecommunications Users Group (CTUG), P.O. Box 143, Glenwood, GA 30428
North East Georgia Commodore User Group, Rt. 2, Box 226, Oakwood, GA 30566
Athens Commodore Users Group, 170 Old Fort Rd., Athens, GA 30606
Athens Commodore Enthusiasts (ACE), 130 St. James Dr., Athens, GA 30606
C-64 Friendly Users Group, 2410 Hog Mountain Rd., Watkinsville, GA 30677
Commodore Club of Augusta, P.O. Box 14337, Augusta, GA 30919
Middle Georgia Commodore User Group, 214 Angus Blvd., Warner Robins, GA 31093
Commodore Craze International, 1284 Lynn Dr., Waycross, GA 31501

HAWAII

20/64 Hawaii, P.O. Box 23260, Honolulu, HI 96822; or 98-351 Koauka Loop, Apt. 1207, Aiea, HI 96701
Makai Commodore User Group (MCUG), P.O. Box 6381, Honolulu, HI 96818
Commodore Hawaii User's Group (CHUG), 1114 Punahou #8A, Honolulu, HI 96826

IDAHO

The Blackfoot Users Group (BUG), 760 Janet St., Blackfoot, ID 83221
Caribou Commodore Club, P.O. Box 535, Soda Springs, ID 83276
Mini-Cassia Computer Club, 2043 Yale Ave., Burley, ID 83318
Best Western User Group (BWUG), Rt. 2, Box 285, Rupert, ID 83350
User Group of Lower Idaho (UGLI), Rt. 4, Box 67, Rupert, ID 83350
Eagle Rock Commodore Computer Club, P.O. Box 3884, Idaho Falls, ID 83403-3884
Banana Belt Commodore Users Group (BBCUG), P.O. Box 1272, Lewiston, ID 83501
GEM-64, Ken Rosecrans, 407 N. DeClark, Emmett, ID 83617
64-BUG (Commodore-64 Boise User's Group), 597 Wickham Fen Way, Boise, ID 83709
The Commodore Corps of the Coeur d'Alene Computer Club (C-Fifth), P.O. Box 007, Harrison, ID 83833

ILLINOIS

McHenry County Commodore Club, 227 East Terra Cotta Ave., Crystal Lake, IL 60014
Northwest Suburban Commodore User Group, 214 South Greenwood, Palatine, IL 60067
PET VIC Club (PVC), 892 Knollwood, Buffalo Grove, IL 60089
Fox Valley Commodore Users Group, 833 Prospect, Elgin, IL 60120

Computers-West, 440 N. Stewart, Lombard, IL 60148
Over the Counter Users Group, 8841 Forestview Rd., Evanston, IL 60203
Commonwealth Edison Employees Commodore Users' Group, 1910 S. Briggs St., Joliet, IL 60433-9987
Computer Hackers of Illinois, 6800 Powell, Downers Grove, IL 60516
Fox Valley 64 Users Group, P.O. Box 28, North Aurora, IL 60542
Midwest C-64 Users Group (MW64UG), P.O. Box 421, Westmont, IL 60559
Chicago B-128 Users Group, 4102 N. Odell, Norridge, IL 60634
The Kankakee Hackers, RR #1, Box 279, St. Anne, IL 60964
Knights of the Round Table, 1724 Pierce Ave., Rockford, IL 61103
Rockford Area Commodore Computer Club, 2507 Pelham Rd., Rockford, IL 61107
Tri-County Commodore Users Group, P.O. Box 564, Erie, IL 61250
Survivors of Sixty-four Users' Group (SOSUG), Dept. of English, Western Illinois University, Macomb, IL 61455
Western Illinois Commodore Users Group (WICUG), 906 W. 6th Ave, Monmouth, IL 61462
Canton Area Commodore Users Group, Spoon River College, RR 1, Canton, IL 61520
PAPUG (Peoria Area PET Users' Group), 800 SW Jefferson St., Peoria, IL 61605
Bloomington-Normal Commodore User Group (BNCUG), P.O. Box 1058, Bloomington, IL 61702
Champaign-Urbana Commodore User Group (CUCUG), P.O. Box 716, Champaign, IL 61820
The 64 User Group of America, 51 Thornhill Dr., Danville, IL 61832
East Side Computer Club, P.O. Box 1347, Alton, IL 62002-1347
Gateway Computer Club, P.O. Box 207, Belleville, IL 62222
Western Illinois PET User Group (WIPUG), Rt. 5, Box 75, Quincy, IL 62301
Southern Illinois Commodore User Club, 1707 E. Main St., Olney, IL 62450
Decatur Commodore Computer Club (DC3), 664 W. Grand, Decatur, IL 62526
Jacksonville Area Commodore Users' Group, P.O. Box 135, Murrayville, IL 62668
SPUG Computer Club, 3116 Concord, Springfield, IL 62704
Capitol City Commodore Computer Club (5 C's), P.O. Box 2961, Springfield, IL 62708
Chess Players' Commodore User Group, 723 Barton St., Mt. Vernon, IL 62864
Southern Illinois Commodore User Group, 508 W. Collins, Goreville, IL 62939
Knox Commodore Club, 675 Arnold St., Galesburg, IL
The C-64 Users Group Inc., P.O. Box 46464, Lincolnwood, IL

INDIANA

Commodore Users Group of Rush County (CUGOR), 829 N. Willow St., Rushville, IN 46173; or Box 22, Manilla, IN 46150
VIC Indy Club, P.O. Box 11543, Indianapolis, IN 46201
Northern Indiana Commodore Enthusiasts (NICE), P.O. Box 95, Mishawaka, IN 46544
Fort Wayne Area Commodore Club, P.O. Box 13107, Fort Wayne, IN 46867
Logansport Commodore Club, 2329 Myers Lane, Logansport, IN 46947
Rochester Commodore Assembly, Rt. 3, Box 143, IN 46975
Columbus Commodore Club, 2676 Lafayette St., Columbus, IN 47201
Bloomington Commodore Users Group (BCUG), 4755 Kinser Pike, Bloomington, IN 47401
Commodore Computer Club, P.O. Box 2332, Evansville, IN 47714
Western Indiana Commodore Users (WICU), P.O. Box 1898, Terre Haute, IN 47808
Commodore Owners of Lafayette (COOL), P.O. Box 5763, Lafayette, IN 47903

IOWA

Capitol Complex Commodore Computer Club, Box 58, Hartford, IA 50118
Newton Commodore User Group, 320 W. 9th St. S., Newton, IA 50208
Commodore Computer User Group of Iowa, P.O. Box 3140, Des Moines, IA 50316
The John Deere Tractor Works Commodore Computer Companions, 7412 W. Bennington Rd., Cedar Falls, IA 50613
3C Users Group, 1008 Allison St., Charles Ctiy, IA 50616
Product Engineering Center Commodore Users Group (PECCUG), 333 Joy Dr., Waterloo, IA 50701
Syntax Errors Anonymous Commodore User Group, R. R. Box 6845, Spirit Lake, IA 51360
Crawford County Commodore Users Group, 519 N. 19th St., Denison, IA 51442
Iowa City Commodore Users Group (ICCUG), P.O. Box 2412, Iowa City, IA 52244
Washington Area Commodore Users Group, P.O. Box 445, Washington, IA 52353
Penn City User Group, R.R. 1, Box 390, Fort Madison, IA 52627
The Commodore User's Group of Clinton, P.O. Box 743, Clinton, IA 52732
Quad Cities Commodore Computer Club, P.O. Box 3994, Davenport, IA 52808

KANSAS

Lawrence Commodore User's Group, P.O. Box 2204, Lawrence, KS 66045
Topeka Commodore Users Group, Inc., 7939 S. Topeka Blvd., #39, Wakarusa, KS 66546
Newton Area Commodore Club, 617 Lincoln, Sedgwick, KS 67135
Commodore User Group of Wichita Inc., P.O. Box 593, Wichita, KS 67201-0593
Salt City Commodore Club, P.O. Box 2644, Hutchinson, KS 67504
High Plains Commodore Users Group, 1307 Western Plains, Hays, KS 67601

KENTUCKY

Gold City Users Group, P.O. Box 257, Ft. Knox, KY 40121
Louisville Users of Commodore of Kentucky (LUCKY), P.O. Box 19032, Louisville, KY 40219-0032
Commodore Users' Group of Central Kentucky, 546 Halifax Dr., Lexington, KY 40503
Capital City Commodore Club (4*C), Rte. 8, Jones Lane, Frankfort, KY 40601
Pendleton Commodore Organization (PENCO), R.R. 2, Box 366, Falmouth, KY 41040
Bowling Green Commodore Users Group, P.O. Box 20214, Bowling Green, KY 42102
Glasgow Commodore User's Group, P.O. Box 154, Glasgow, KY 42141
Logan County Commodore Users Club, P.O. Box 302, Lewisburg, KY 42256
The Commodore Connection, 1010 S. Elm, Henderson, KY 42420
Commodore Users Group of Madisonville (CUGOM), P.O. Box 849, Madisonville, KY 42431

LOUISIANA

Commodore-Pet User Group (C-PUG), 2308 Houma Blvd., Apt. 724, Metairie, LA 70001
Sixty Four'Um User Group, 4317 Stockton St., Metairie, LA 70001
Commodore PET User Group, 616 N. Niagara Circle, Gretna, LA 70053
Commodore Users Group of Slidell (CUGS), 1326 Sunset Dr., Slidell, LA 70460
Southwest Louisiana User's Group (SLUG), 99 Ann, Sulphur, LA 70663
64 Club of Baton Rouge, 8255 Florida Blvd. Suite 206, Baton Rouge, LA 70806
Baton Rouge Area Commodore Enthusiasts (BRACE), P.O. Box 1422, Baton Rouge, LA 70821
Ark-La-Tex Commodore User Group, P.O. Box 6502, Shreveport, LA 71108
Worldwide Commodore User Group, Ark-La-Miss Division, P.O. Box 371, Quitman, LA 71268
Northeast Louisiana Commodore User's Group, P.O. Box 175, Swartz, LA 71281
Zero-Page Commodore User Group, 1311 Peterman Dr., Alexandria, LA 71301-3433

MAINE

Maine Commodore 64 User Group, P.O. Box 542, Ogunquit, ME 03907
Your Commodore Users Group, Brunswick Chapter, 175 Columbia Ave., Brunswick, ME 04011
Your Users Group (YUG), P.O. Box 1924, N. Windham, ME 04062
Compumania, 81 North St., Saco, ME 04072
Southern Maine Commodore, P.O. Box 416, Scarborough, ME 04074-0416
Your Commodore Users Group, 18 Colony Rd., Westbrook, ME 04092
Southern Maine 64 Users Group, 9 Lynda Rd., Portland, ME 04103
COM-VICS, P.O. Box 1541, Auburn, ME 04210
Commodore Hackers Advanced Operating System (CHAOS), 750 Hancock St., Rumford, ME 04276
Computer User Society of Penobscot, c/o 101 Crosby Hall, University of Maine at Orono, Orono, ME 04469
Southern Aroostook Commodore User's Group (SACUG), P.O. Box 451, Houlton, ME 04730

MARYLAND

C.C.C.C., Rt. 2, Box 197, Pomfret, MD 20675
Southern Maryland Commodore Computer Users Group (SMCUG), 4115 Cassell Blvd., Pr. Frederick, MD 20678
Federation of Commodore User Societies, Inc. (FOCUS DC/MD/VA), P.O. Box 153, Annapolis Junction, MD 20701 *(Note: This is a federation consisting of 15 user groups in the VA/MD/DC area, not a club offering individual memberships.)*
Southern MD Commodore User Group, 6800 Kilarny St., Clinton, MD 20735
Hyattsville Commodore User Group, 7209 Dartmouth Ave., College Park, MD 20740
C-64 Users Group FGGM, 7238-C Hall St., Ft. Meade, MD 20755
TriTech's Commodore Users Group, 10100 Ormond Rd., Potomac, MD 20854
West Montgomery County C-64 User Group, 8700 Hidden Hill Lane, Potomac, MD 20854
Rockville Commodore Users Group, P.O. Box 8805, Rockville, MD 20856
Gaithersburg C-64 Users Group, P.O. Box 331, Washington Grove, MD 20880
Montgomery County Commodore Computer Society, P.O. Box 2689, Silver Spring, MD 20902
VIC Appreciators (VICAP), 10260 New Hampshire Ave., Silver Spring, MD 20903
Compucats' Computer Club, 680 W. Bel Air Ave., Aberdeen, MD 21001
Jumpers 64 User Group, 712 Snowden Ln., Glen Burnie, MD 21061
Commodore Computer Kids (for ages 7–100), 403 Avery Ct., Joppa, MD 21085
Commodore Users Medium—Baltimore Area Computer Club (CUM-BACC), P.O. Box 479, Reisterstown, MD 21136-9998
BAYCUG, 110 Danbury Rd., Reisterstown, MD 21136
CUM-BAC, P.O. Box 479, Reisterstown, MD 21136
Westinghouse Friendship Site Commodore Users Group, Westinghouse Elec. Corp., P.O. Box 1897, Baltimore, MD 21203
Baltimore Area Commodore Users Group (Bay-CUG), 4605 VOGT Ave., Baltimore, MD 21206
Randallstown Commodore User Group, 3702 Durley Ln., Baltimore, MD 21207
Baltimore Commodore Users Group (BCUG), 402 Waverly Ave., Baltimore, MD 21225-3437
C-16 & Plus/4 Users Group, 8202 Edwill Ave., Baltimore, MD 21237
Hagerstown User Group (HUG), 23 Coventry Lane, Hagerstown, MD 21740
Wicomico Commodore Users Group, 1306 Hamilton St., Salisbury, MD 21801

MASSACHUSETTS

Pioneer Valley Commodore Club, 6 Laurel Terrace, Westfield, MA 01085
The Commodore Connection, 132 N. Ridge Rd., Westfield, MA 01085
Commodore 64 User Group of the Berkshires, 184 Highland Ave., Pittsfield, MA 01201

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Choosing A Path

Jeffrey E. Phipps

How do you handle a yes/no response within a program? The usual technique is to GET a key, use an IF-THEN to see if it's a "Y" character and branch to the proper line, then use another IF-THEN to branch elsewhere if it's "N." On the VIC and 64, this requires at least two IFs on separate lines.

With the 128 you can test multiple possibilities by stringing ELSEs after IF-THEN statements:

```
45 GETKEY A$: IF A$="Y" THEN 500:
   ELSE IF A$="N" THEN 700: ELSE 45
```

There *is* a way to simulate an ELSE for the VIC and 64. But first we should take a look at how ON-GOTO and ON-GOSUB work.

These two commands most commonly take a numeric variable, after ON, and a list of line numbers, after GOTO or GOSUB:

```
80 IF H=1 THEN 410
90 IF H=2 THEN 450
100 IF H=3 THEN 700

200 ON H GOTO 410,450,700
```

In line 200, if the value in variable H is 1, the computer goes to the first line number (410) in the list. If H is 2, the program jumps to the second line (450), and so on. Thus, the ON-GOTO in line 200 does exactly the same thing as lines 80–110. It's also more compact, runs faster, and uses less memory.

A variation of ON-GOTO can check whether the user pressed Y or N, and branch accordingly:

```
45 GET A$: ON ((A$="Y")*2 +
   (A$="N") +3) GOTO 500,700,45
```

The key to this line is knowing how a computer views true and false statements. If the expression (A$="Y") is true, BASIC assigns it a value of −1. If not, it's given a value of 0.

So if the user pressed Y, the computer calculates ((−1)*2 +(0) + 3), a value of 1, which triggers the GOTO to line 500. If the user pressed N, the computer calculates ((0)*2 +(−1) + 3), a total of 2, so the ON-GOTO branches to the second line number. Finally, if any other key was pressed, the sum is ((0)*2 +(0) + 3), and the program goes to line 45 to GET another key.

Instead of putting a variable into the ON-GOTO, we've used expressions as pseudo-variables that are equal either to −1 or 0.

An Array Of Addresses

Michael Mayers

Arrays usually hold variables. But you can also store memory addresses in arrays to make POKEing and PEEKing much easier. For example, there are seven registers for each voice in the 64's SID chip:

0	Low byte of frequency
1	High byte
2	Low byte of pulse width
3	High byte
4	Gate/waveform/ring mod/sync
5	Attack/decay
6	Sustain/release

It's easy to set up a two-dimensional array for the SID registers:

```
10 DIM SID(3,6)
20 FOR J=0 TO 6
30 SID (1,J)=54272+J
40 SID (2,J)=54279+J
50 SID (3,J)=54286+J
60 NEXT
```

Now let's say you want to store a 99 into the attack/decay register (register 5) of voice 2. After setting up the array, **POKE SID(2,5),99** (much easier to remember than POKE 54284,99). To make it even easier, name the seven registers with variables. You could use **AD=5: SR=6**, and then to set up the envelope for voice 3, **POKE SID (3,AD),52: POKE SID (3,SR), 131.** It not only makes programming music simpler, it makes the program listing more readable.

This idea can be helpful for other memory locations as well. Sprite colors and positions, for example, could be put into an array.

Fast-Forward Autostop For 64

Robert V. Taylor

It's aggravating to have to fast-forward a long tape to a position that's close to the end. You watch the counter with your finger poised on the stop button, ready to push it at just the right time. The following program asks you to enter the tape position and it does the rest: The program stops the tape at the right time. When you hear the buzzer, look at the tape counter; it should be very close to your program.

```
20 PRINT"ADVANCE COUNTER TO":I
   NPUTC
30 PRINT"PRESS FAST FORWARD"
40 WAIT1,32,32
50 L=199+(C/100)↑1.95:L=L-(C/1
   0)-(C/10)
60 FORJ=1TOC:FORK=1TOL:NEXTK,J
70 POKE192,32:POKE1,55
80 S=54296:FORJ=1TO60:POKES,15
   :POKES,0:NEXT
```

This program is very accurate on my old C2N Datassette. It's almost perfect up to 100 and it's off by only three at the far end of the tape. You may need to adjust it for your unit, however. Try raising or lowering the number 1.95 in line 50. A little experimentation should reveal the best number. The variable L controls the size of the delay loop in line 60. The larger the value, the more time the loop takes and the longer the tape runs. If you're overshooting your target, lower the value of 1.95 in line 50.

Super Synth

Lawrence Cotton

Your 64 never sounded this much like a real synthesizer. With a playable keyboard and saveable sounds, this innovative program is fun for the novice and educational for the more serious music programmer.

No two electronic keyboards—whether they're synthesizers or computer-based keyboards—are exactly alike. But electronic keyboards have one thing in common: They're programmable. The sounds are basically controlled by turning knobs, sliding controls, or pressing buttons in various combinations.

This one's a bit different. In "Super Synth," the settings are controlled completely by the computer. You play notes on the keyboard, but the sound waveforms and modifiers are generated completely at random by the computer. You have absolutely *no* control over the sounds—but you'll be amazed at some of the sounds it can create.

The basis of these thick, animated sounds is two voices playing slightly out of tune with one another. So even the less complex sounds have richer nuances than would be possible with single-voice sounds. Add ring modulation, synchronization, vibrato, and sweep (the last two courtesy of voice three), and you have some really nice—and some not so nice—sounds.

The computer doesn't care whether the sounds are musically pleasing or not, so some will be downright awful. Depending on your musical perspective, the percentage of musically acceptable sounds ranges from about 10 to 50 percent.

Recording The Sounds You Want

When you get a nice sound with Super Synth, you can take a "snapshot" of it as you hear it. As you build a library of favorite sounds, you can load them from disk to play on the keyboard.

Seven waveforms are used: triangle, sawtooth, square, noise, ring modulation, sync, and the unlikely combination of square/triangle/ring mod. Two of these waveforms are independently assigned to the first two voices, but occasionally voice two is turned off completely to allow the sweeping effect to become more obvious. Voice three is used only for modulation purposes.

After typing in the program, save it to disk and run it. After about a ten-second delay while frequencies are being calculated, the keyboard will be displayed. Its pitches are continuous, but physically interrupted. That is, the ↑ and the Z are musically adjacent white notes on the piano. "Q" is the lowest note, and ";" is the highest.

Most electronic keyboards depend on the user to set up the first sound, but this one defaults to (begins with) a good basic synthesizer-like sound. To generate a new sound, press f3. Random values will be sent to the sound chip. Now play a few notes to hear the sound. If you don't like it, press f3 again.

If you wish to save or load a sound, press f5 or f7 respectively. (Rather than trying to coin names for each of these sounds, consider just numbering them consecutively.) Pressing f1 at any time returns the computer to the beginning sound.

The only input from the user is from the menu on the screen with the keyboard. Besides the note keys themselves, the only keys used are the function keys (mentioned above) and the RETURN key,

which displays the values of the sound currently being heard. If you're experienced at programming the SID chip, you can use these values in your own programs.

Program Structure

Lines 100–210 calculate the frequencies needed to produce pitches ranging from C3 (Q key) to D#6 (; key). Each note, for each voice, requires two values (high and low bytes of the note's decimal frequency). These values are calculated and stored in arrays F1 and F2.

To achieve the richer basic sounds, voice one's frequencies are multiplied by a factor M (1.005) for voice two, which is pitched just slightly higher than voice one. These are stored in arrays F3 and F4. Arrays G1–G4 and H1–H4 contain values for frequencies one octave higher and lower, respectively.

Lines 220–240 define constants, initialize variables, and GOSUB to line 490, a routine to print the keyboard screen. Lines 250–270 POKE the default values to the SID chip.

Lines 280–460 are the heart of the program; they form a continuous loop which looks at memory location 197—the key currently being pressed. When the value there is less than 8 (RETURN or the function keys), control goes to line 470. (The INST/DEL and cursor keys also return values less than 8, but the program just loops back to 280 when they are pressed.)

The secret to quick keyboard response is to have all the frequencies pre-stored in arrays whose "addresses" correspond to the keyboard matrix values PEEKed at 197. When a key is pressed, the precalculated frequency values are POKEd to the SID chip and the voice is turned on.

Line 300 sends control on to other lines, depending on the random value of Z. The random value of FL further modifies the path the program takes. Two key memory locations to note are V+27 (54299) in line 400 and V+22 (54294) in line 410. Location 54294 controls the cutoff frequency of the programmable filter for sweeping sounds. Location 54299 reads voice three's waveform and thus controls vibrato.

Lines 340 and 350 POKE one of voice three's frequency registers with a multiple of voice one's frequency; this controls the synced and ring modulated sounds if waveforms 21, 23, or 85 are randomly selected.

Lines 310, 320 and 460 POKE the arrays' values to the frequency registers to produce sounds one octave higher, one octave lower, and at the basic pitches, respectively. Lines 370 and 430 turn the notes on and off.

Line 470 sends control to other parts of the program, depending on whether the RETURN or function keys are pressed. The subroutine at line 480 calculates envelope values (from attack, decay, sustain, and release values) to be POKEd into voices one and two. Voice three's envelope generator is not used.

Lines 490–630 print the keyboard screen.

Lines 640–680 contain 40 pairs of data units: the key matrix location (PEEKed at 197) and the corresponding note's decimal frequency.

Lines 690–1040 are the randomizing subroutine. Without going into a lot of detail, the choices yield six values for Z, three values for FL, 255 step limits, seven waveforms for each of voices one and two, 33750 different envelope values (the same values are POKEd into voices one and two; attack is limited to ten values), four filter combinations, 40 sweep step sizes, four vibrato shapes, 145 vibrato speeds, eight different square wave shapes for each of the three voices (voice three's waveform controls the shape of the vibrato), and three different filters (low-pass, mid-pass, and high-pass). Unfortunately, not all of these millions of combinations will produce audible differences in the sounds.

Lines 1050–1190 print the values screen and wait for you to press RETURN. These values are printed on the screen in the same order that a sound is saved to disk.

The values for Z cause the following effects: 1-octave up, 2-unison, 3-ring modulation, 4-sync, 5-repeat, and 6-octave down. The values for FL are: 0-normal, 1-vibrato, and 2-sweep. The four resonance values POKEd to 54295 are: 240-no voice is filtered, 241-voice one is filtered, 242-voice two is filtered and 243-both voices are filtered.

Step limit (SL) and sync speed (XT) are used in line 380. ADSR values are not POKEd directly to the sound chip; they are used to calculate POKEable values (AD and SR) in the subroutine at line 480. Vibrato speed (VI) is POKEd to 54286; vibrato shape (VS) is POKEd to 54290; and the filter value (VO), which includes full volume of 15, is POKEd to 54296.

Lines 1200–1310 contain the subroutines for saving and loading sounds to and from disk. Note that there are *no* error-trapping routines here, so be careful what you type when saving to or loading from the disk.

See program listing on page 100.

Violin Lessons

When writing this article, the author stumbled on a "patch" (synthesizer jargon for a group of switch, knob, and slider settings) which very closely simulates the sounds of a violin played by an amateur. The patch is extraordinarily (and humorously) realistic.

Here's how to create and save "Violin Lessons":

1. Type in and save the following program, "Sound Patcher," to disk. When you run it, it will create a short file on your disk called "VIOLIN LESSONS"

Sound Patcher

```
100 POKE53281,0:PRINTCHR$(147)
   CHR$(5)
110 S$="VIOLIN LESSONS":OPEN1,
   8,1,S$
120 FORT=1TO17:READV:PRINT#1,V
   :NEXT:CLOSE1:END
130 DATA2,1,33,33,10,8,8,8,240
   ,1,9,17,8,8,8,31,0
```

2. Load and run "Super Synth." Confirm that sound is there by pressing a few keys.

3. Press f7, type VIOLIN LESSONS, and press RETURN.

4. Play the keyboard in the usual way, especially the letters X V N B V B C V repeatedly.

Word Counter

Thomas K. Tucker

If you ever need a quick word count of a document, this program is for you. It works with text files—program or sequential—created by almost any word processor. For the 128, 64, Plus/4, 16, and VIC-20. A disk drive is required.

Teachers are fond of giving assignments in terms of words: a "3,000 word term paper" or a "500 word essay," for example. I recently wrote such a paper using the word processor *SpeedScript*, but when I finished writing, I had no idea of the number of words. It seemed to me it would be a fairly easy task to write a program to count the words in a file, but first I had to determine what constituted a word.

Spaces separate words from neighboring words, so the number of spaces in a document should equal the number of words. The only snag would be multiple spaces in the file. I didn't want to count *all* the spaces, just the ones immediately preceded by a character that was not a space.

The BASIC program I came up with looked something like this:

```
10 Z=0:A$="":B$=""
20 INPUT"FILENAME";F$
30 OPEN 1,8,0,F$+",P,R"
40 GET#1,A$
50 IF 64 AND ST THEN 90
60 IF A$=CHR$(32) THEN IF B$<>
   CHR$(32) THEN Z=Z+1
70 B$ = A$
80 GOTO 40
90 CLOSE 1
100 PRINT"NUMBER OF WORDS IN
    FILE : ";Z+2
110 END
```

Line 50 checks for the end of the file. Line 60 rules out counting consecutive spaces as more than one word. By experiment, I found that by adding 2 to the counter (Z) a more accurate count is shown. Since printer format codes and carriage returns are counted as words, a 100 percent accurate count is not possible. But it's rarely important that the final number of words is exact. (Is anyone penalized for being six words short in a 2,000 word paper?)

Speeding It Up

The BASIC program above took over four minutes to count about 2,500 words. Much too slow.

Writing the loop part of the program (lines 40 to 80) in machine language (ML) seemed to be the answer. Since it's a short routine, it fits nicely into the cassette buffer at $033C (828). The ML data is POKEd into the cassette buffer using DATA statements.

Later I added the directory routine and the option of counting sequential as well as program files. This program should read files written on any word processor—but remember, the more printer code strings used in the file, the less accurate the word count. In any case the program is pretty fast, taking about 40 seconds to count a 2,500 word, 60-block file.

How To Use It

Word Counter is easy to use. Type in the program and save a copy to disk. As listed, the program works on the 64, Plus/4, 16, and VIC. If you have a 128, substitute the following lines:

```
PB 10 PRINT"{CLR}"CHR$(142):BS
      =3072:COLOR0,7:COLOR4,7
HH 340 DATA 169,0,141,0,12,141
       ,1,12,141,66,12,141,67,
       12,162,1,32
BK 350 DATA 198,255,32,183,255
       ,41,64,208,34,32,207,25
       5,141,66,12,201,32,208,
       15
QJ 360 DATA 32,207,255,201,32,
       240,8,238,0,12,208,3,23
       8,1,12,173,66,12,141
BQ 370 DATA 67,12,76,21,12,32,
       231,255,96,3,4,-1
```

After you've finished writing and saving your document, load Word Counter and type RUN. The first prompt is "Press D for Directory." Insert the disk containing the text file and press D. You're then asked to type in the filename and type P (Program) or S (Sequential) for file type. Word Counter reads through the file and seconds later displays the number of words. You're then asked if you'd like to count the words in another file.

Editor's Note: We tested Word Counter with text files created by SpeedScript *(64 and VIC versions),* Paperback Writer *(128 and 64 versions),* Word Writer 128, *and the word processor built into the Plus/4. The program gave a reasonably accurate count with these files (program or sequential), which were of varying length.*

See program listing on page 101.

Coder-Decoder

W. M. Shockley

Protect the privacy of your DATA statements with this short routine that scrambles and restores any text. It's useful in almost any program that keeps information in DATA statements. For the 64, 128, Plus/4, 16, and VIC.

Probably the most convenient way to store lists of information in BASIC programs is to use DATA statements. A word game like Hangman, for instance, might have 50–100 words in DATA. The questions and answers in a trivia game would fit nicely in DATA statements. An adventure game would contain lists of rooms and their treasures. A history quiz would contain names and dates. There are many possibilities.

But DATA statements aren't very secure. Someone can easily list the program, where the words, questions, rooms, history facts, and so on are right there for the user to read or memorize. In other situations—a personal diary, say—you want the information kept secret from anyone but yourself.

Scrambling Characters

"Coder-Decoder" is a short utility program which transforms normal DATA inputs into seeming gibberish. If the program is listed, the DATA statements are almost impossible to read. A second part of the program (lines 63210 on) retranslates the gibberish into the original DATA statements.

Type in the program and save a copy. It works on the VIC and 64 as listed, but can be modified to work on the 128, Plus/4, and 16 by changing line 63020 as follows:

For the 128:

```
63020 Y=842:Z=208:B$=""
```

For the Plus/4 and 16:

```
63020 Y=1319:Z=239:B$=""
```

Coder-Decoder allows DATA statements to be typed in directly, without line numbers or the word DATA. It uses the dynamic keyboard technique to add DATA statements to memory. The Coder section (lines 63010–63130) can be used as a subroutine to generate statements for a program already in memory. It can be added as is. Once it's in memory with the program, just type **RUN 63010**. It will continue until the word END is typed at the prompt.

Adding It To A Program

The two routines are short enough so that they can be listed on the screen (after being loaded) and added to a program on 40-column computers (unfortunately, this technique won't work on the VIC). Load the Coder portion of the program and list it on the screen. Load the program to which it is to be appended. Then go to the top of the screen and press RETURN enough times to enter the lines of the Coder routine into the program in memory.

The Decoder section (lines 63210–63300) can be added in the same way. This routine turns the DATA statements back into what you originally typed in. The DATA statements are read into the variable A$. After decoding, an unscrambled word is returned to the program as B$. When you have more than one DATA statement, use a FOR-NEXT loop to retrieve the coded words.

There are a couple of limitations which must be observed. Commas, colons, and semicolons cannot be used in the inputs. The letters and numbers and extra characters which can be used are listed in S$, defined in line 63220. Others can be added by extending S$ and S1$ and the 41 in the R loop (line 63080 in the Coder routine and line 63260 in the Decoder routine).

In addition, each input must be no longer than 116 characters on the 128, and up to 70 characters on the 64, VIC, Plus/4, and 16.

See program listing on page 98.

Read-A-Tune

Donald J. Eddington

Even children can compose easily with this program. You can store dozens of your songs in memory or on disk and play them back later. For the 64, VIC with at least 8K expansion, Plus/4, and 16. A disk drive is required.

You might call this program a sort of music processor. You write melodies which can then be played back. If you like the tune, save it to disk. It's easy enough for children to use and could serve as a valuable educational tool for those who are just learning to play music. You'll find this a versatile program that you can fully use within minutes.

Type in the appropriate version for your computer and save a copy before running it the first time. After running the program, you'll see this menu:

```
1=Write a song
2=Play back your song
3=Recall your songs
4=Save your songs
5=Twelfth Street Rag
6=Yankee Doodle
7=Some really fast scales!
8=End of program
```

Select 1, and "Read-a-Tune" will rely on *your* talents at writing songs. First, you're asked to name the song. Song titles can be up to 20 characters long (15 on the VIC). The screen tells you the notes that Read-a-Tune understands, and their note-name equivalents. Most of these are direct: C is middle C; F is F; A is A; and H is High C. Be sure to use only the listed note values; any other letters or numbers are assumed to mean the note A.

You'll hear the notes play as you enter them. Rhythm is achieved by using a series of short notes to make one long note (write AAAA for a long A). Use R for any rests. You would write AARAA to get two midlength A's, for example. (See "Special Notes" below for more details on time values.) Now you're ready to begin. You can get out a music book and enter your favorite songs, or compose songs of your own.

Be sure that each song does not exceed 254 notes, a little more than six printed lines on the screen (11½ lines on the VIC). Exceeding this limit will either cause only the last few notes of your song to be stored, or a STRING TOO LONG error. Use the INST/DEL key to correct mistakes. When you finish typing in your song, type a period to mark the end of the song and press RETURN.

If you have written a song using option 1 from the menu, you can call it at any time to hear it. Just press selection 2 and a list of your songs is displayed. Use the cursor keys to move the arrow to the song you want, press RETURN, and the tune you wrote will print and play for you. Now you can play any of the other preprogrammed tunes and be assured that the tune you just wrote is still stored in memory. You can also write another tune (with selection 1) and it will be stored and can be played back later. You're limited only by the memory available on your computer: Up to 125 songs can be stored this way on the 64, 25 songs on the VIC with 8K expansion (55 songs with 16K expansion), 190 songs on the Plus/4, and 25 songs on the 16.

If you really like a song you've written, and want to save it to disk, select 4 and give the song a unique filename. If you give it the name of an existing file, it will write over it. Select option 3 to load a song from disk.

Selections 5–7 play preprogrammed tunes. You can play the tunes in any order, like a jukebox. Press 5 if you want to hear the "Twelfth Street Rag," or press 6 for "Yankee Doodle." Selection 7 plays a series of very fast scales. Finally, selection 8 turns off the whole music system.

Special Notes

Avoid using any character not listed as a valid note on the tune values table. Most invalid characters will play the note A, but a space or a period is interpreted as end-of-tune markers. All graphics characters are assumed to be A's.

Timing is achieved by adding together short notes. Use the following chart to get the proper number of notes:

Note	Number of Occurrences
eighth	1
quarter	2
dotted quarter	3
half	4
dotted half	6
whole	8

Repeated notes of the same pitch must be written with a rest in between to execute as two separate notes. For example, to write the first six notes of "Jingle Bells," use this sequence: ERERREEERERREEER.

Getting Started

Here are some songs to try out—see if you can guess the tunes.

```
CRCRDRERCRERDRMRCRCRDRERCCC
  COOMMCRCRDRERFFEEDDCCOOM
  MNNOOCCCRCCCR
CRCDRDEGECRMCRCDEFEEECRMCR
  CDRDEGECCRARRDDFEEECCCR
DEFFEEDRDEFAEFDRDEFFEEDRDEF
  AEFDRFGAIAIAGEFGHGHGFDEFFE
  EDRDEFFFAAAEEEEFFFFDDDDDDR
GGGAGGFFEEFFGGGRDDEEFFFREE
  FFGGGRGGGAGGFFEEFFGGGRDD
  RRGGRREECCCCRR
```

See program listings on page 102.

Double Load

Darius L. Ecker

Now users of combination programs such as *SpeedScript* with "Preview-80" or "Plus/Term" with "Screen-80" can have automated loading on the Commodore 64 and 128 (in 64 mode). No more typing in commands and remembering SYS addresses. Just load and run one program—the rest is done for you.

Both COMPUTE!'s GAZETTE and COMPUTE! have published programs that work in conjunction with another program. "Preview-80" (COMPUTE!'s GAZETTE, November 1985), for example, adds an 80-column preview option to *SpeedScript*. To get the two to work together takes four steps: You load Preview-80, type NEW, load *SpeedScript*, and then SYS 52000. And to get "Screen-80" (COMPUTE!'s GAZETTE, September 1984) to work with "Plus/Term" (COMPUTE!, February 1985), you must load the first program, run it, then load the second and run it.

"Double Load" uses the dynamic keyboard technique to load two programs and execute whatever command (RUN or SYS) is necessary. And by studying the program, you'll be able to find other applications for this idea.

The Dynamic Keyboard

The dynamic keyboard is a well-known loading technique on Commodore computers. If you're unfamiliar with it, here's a brief introduction.

From within a program, you clear the screen, which leaves the cursor in the home (upper-left) position. Now you have the program print two cursor downs, then the appropriate LOAD command and four cursor downs, followed by either a RUN command or a SYS, and then HOME to move the cursor back to the top. The screen is ready. Now you could end the program and tell the user to press RETURN. The screen would print SEARCHING FOR PROGRAMNAME on one line, LOADING on another, and then READY. The cursor would be placed on the RUN or SYS, ready for the user to press RETURN again.

But we won't ask the user to do all that. The dynamic keyboard technique allows us to press those keys from inside the program.

The 64's *keyboard buffer* occupies memory locations 631–640. It keeps track of which keys have been pressed. So if we POKE locations 631 and 632 with the code for RETURN (the number 13), the computer will think that the user has pressed RETURN twice.

One more POKE is necessary. Location 198 tells the operating system how many characters are in the keyboard buffer. By POKEing 198 with the number of characters we have placed in the keyboard buffer, and then ending the program, the keyboard buffer is activated. Since the commands have been printed to the screen in the right places, they execute in the immediate mode.

Problems arise when we run a program from the immediate mode. After the RUN or SYS is executed, the computer is under control of the executed program, and no more of the preprinted commands will be carried out. However, Preview-80 and Screen-80 are ideally suited as pre-loaders. Preview-80 is not executed before loading *SpeedScript*. Although Screen-80 is run before loading Plus/Term, it still accepts commands in the immediate mode, and the dynamic keyboard technique can be used.

Preview-80 And *SpeedScript*

Program 1 loads Preview-80 and *SpeedScript*. Since Preview-80 is a machine language program that loads at the top of memory out of the way of the BASIC program area, we can safely load it from program mode without using the dynamic keyboard. This is done in line 10. *SpeedScript*, however, loads into the BASIC area and will erase Double Load, so we must use the dynamic keyboard technique. Line 20 prints LOAD"SPEEDSCRIPT",8 and SYS52000 at the proper locations so that they will be executed when line 30 puts two RETURNs into the keyboard buffer.

Type in the program, inserting your own filenames in lines 10 and 20, and save a copy. Preview-80 and *SpeedScript* must be on the same disk as Double Load with filenames matching those in lines 10 and 20. Now load and run Double Load and you're ready to do word processing with *SpeedScript* and Preview-80.

Screen-80 And Plus/Term

Loading Screen-80 and Plus/Term is more difficult for two reasons. First, Screen-80 must set up the 80-column screen before Plus/Term is

loaded. This clears the screen and erases any commands we may have printed there. But we can solve the problem by inserting the command to load Plus/Term into the keyboard buffer (instead of printing it to the screen).

The second problem is the size of the keyboard buffer, a mere ten characters, of which two are used to load and run Screen-80. This leaves us with eight characters. Even using the abbreviated BASIC commands for LOAD (L SHIFT-O) and RUN (R SHIFT-U) and using a single character filename for Plus/Term, the buffer leaves us one character short. The solution? We POKE the extra character into the buffer *after* the two RETURNs for loading Screen-80 have been used. Instead of simply printing RUN to run Screen-80, we print POKE 639,131:POKE 198,9:RUN. This line is entered by the second RETURN. At that point, the two RETURNs have left the buffer and made room for the extra character. The two POKEs put the code for SHIFT–RUN/STOP at the end of the buffer to complete the string of characters that will load and run Plus/Term.

Type in Program 2, substituting your own filename for Screen-80 in line 20, and save a copy. Both Screen-80 and Plus/Term must be on the same disk as Double Load. The BASIC portion of Plus/Term must be saved under the single character filename "P". Also, a copy of the machine language portion of Plus/Term must be included on the disk under the original filename ("PLUS/TERM.ML") given in the February 1985 COMPUTE! article.

When Plus/Term executes, a menu to select baud rates will appear in 80- column format. After selecting the baud rate, the screen will blank. Press f7 and the main menu will appear. See the documentation in the appropriate issue of COMPUTE! before attempting to use this program.

If you're an avid user of *SpeedScript*, Screen-80, or Plus/Term, I'm sure you'll find Double Load to be a timesaver and a valuable addition to your program library. And with a little practice, you might be able to apply some of these techniques to your own programs.

See program listings on page 98.

horizons

A BASIC 7.0 Compiler

Charles Brannon
Program Editor

The Commodore 128 looks like it will be a great success. Although Commodore 64 compatibility is its ace in the hole, good 128-mode software is essential for its continuing popularity. I've had a problem with the 128, though. If you're writing a program for the 128 that doesn't use 80 columns or more than 64K of memory, why write it for 128 mode? The program would work just as well in 64 mode, and would be less trouble to write if you're more familiar with the 64. Your program would be able to run on all 64s *and* 128s. The mere convenience of not having to type GO 64 isn't worth the work it takes to convert a 64 program to 128 mode. Naturally, if you can find a significant way to use 128K, 80 columns, and the FAST mode, you'll want to write the program for 128 mode.

But there's another good reason to use 128 mode: BASIC 7.0. This is a luxury BASIC, at least compared to VIC and 64 BASIC. Finally, we have the commands needed for sound and graphics, disk file programming, error checking, and structured programming. Although the 64 could do everything that BASIC 7.0 does with machine language (ML) extensions, it's much easier and faster to program in BASIC 7.0. But unless you go into FAST mode, BASIC's significantly slower in 7.0 than it was with the 64. It's difficult to write arcade-style games, even when you don't need PEEKs or POKEs. Applications like sorting, searching, and merging are expedited by the high speed of the 1571 disk drive, but BASIC just can't keep up with the 1571, especially when using GET# to read files. What we need is a speed enhancer for BASIC, a turbo-charged *compiler*.

Compilers translate source code into either a high-speed interpreted language (P-code), or directly into ML. P-code is much faster to interpret than the original source code of BASIC. Since the compiler can look at the whole program at once while generating the compiled code, it can optimize your program for speed. An interpreter can see only one character at a time. For example, the compiler turns GOTOs and GOSUBs into high-speed jumps to the actual address of the target line, instead of having to search through the program to find the target line number. Even though P-code is interpreted, it's designed for streamlined interpretation. P-code would make little sense to a human, even if we could list it (and we can't). It's not a good language to program with directly, but it's ideal for use with compilers, where you can translate from a readable BASIC program.

When a compiler generates optimized ML, it's the next best thing to writing your own ML. But BASIC is a high-level language, which allows ambiguities to creep in. There are myriad ways to multiply by two, but ML has a single instruction that can do this within a few millionths of a second. A compiler cannot always figure out that X=2:Y=8:PRINT X*Y should use this high-speed trick, since the values of X and Y may not always be constant in a BASIC program.

Although you can speed up your programs ten or twenty times by compiling to ML, the ambiguities lead to inevitable inefficien-

cies. An experienced ML programmer who manually translates a BASIC program into ML may be able to speed it up a thousand times or more. And the ML version generated by a compiler may be ten times longer, where the human-generated ML program would probably be shorter.

BASIC-128

The Abacus *BASIC-128* compiler is ingenious; it may be the most complete compiler system yet for eight-bit computers. *BASIC-128* can compile any BASIC 7.0 program—it's completely compatible with all commands and statements, and generates a much faster program. If you're willing to sacrifice some compatibility, you can produce even faster, optimized code. You can choose between P-code (fast and compact), or ML (faster, but quite a bit larger) code generation. A second level of optimization lets you further accelerate programs that don't need floating-point math. Even if you use floating-point, this compiler can double or quadruple the speed of certain floating-point functions, a feature usually seen only on expensive compilers for computers with math coprocessors.

You can embed special compiler commands in your program with REM. These commands can select the type of code generation (P-code or ML), optimization level, even whether some variables should be treated as integers, without having to use the percent sign with them. This lets you really speed up FOR/NEXT loops, since BASIC doesn't let you use an integer variable with FOR/NEXT. Within the same program, you can change the level of optimization and the choice of P-code or ML, letting you optimize some subroutines in ML, while preserving compatibility with floating-point operations where necessary.

You can also select these options and several special purpose features (such as selecting the memory boundaries of the compiled program, generating a line-list for error tracking, and turning off the code generator) from the *BASIC-128* compiler menu. Other special features of the compiler let you compile programs using BASIC extensions, merge compiled programs with ML, even generate overlays to permit virtual programs as large as the disk can hold.

Compiling a program doesn't take more than five to ten minutes for average-sized programs (scanning one to two thousand bytes per minute), and it's worth the wait. Just how fast is *BASIC-128*? Although Abacus's early Commodore 64 BASIC compiler left something to be desired, this package can give you speed increases in excess of 2000 percent. In the FAST mode (80 columns required if you want to see the screen display), you can double this speed. The compiler can even switch on and off FAST mode automatically if you need to use a 40-column display, giving you an average speed somewhere between normal and FAST mode.

To test *BASIC-128*'s speed, I've once again resurrected my own favorite benchmark, the bubble sort. Although no single benchmark can adequately test a computer's speed or accuracy, the bubble sort is a good one. So that you can evaluate what I'm testing here, refer to this program:

BASIC Bubble Sort

```
MS 10 REM BUBBLE SORT BENCHMAR
      K
AA 20 PRINT"{CLR}GENERATING LI
      ST"
FA 30 DIM A%(100):FORI=1TO100:
      A%(I)=101-I:NEXT
QB 35 FORI=1TO100:PRINTA%(I);:
      NEXT:PRINT
BC 40 PRINT"{RVS}SORTING":TI$=
      "000000"
FJ 50 EX=0:FOR I=1 TO 99:IFA%(
      I)>A%(I+1)THEN T=A%(I+1)
      :A%(I+1)=A%(I):A%(I)=T:E
      X=1
HK 60 NEXT:IFEXTHEN50
BA 70 T$=TI$:PRINT"DONE!":PRIN
      T"IN ";TI$;" AND";TI;"JI
      FFIES."
FH 80 FORI=1TO100:PRINTA%(I);:
      NEXT
```

I tested the speed of the compiler with the P-Code/Level I Optimization (most compatible with all programs), and the Machine Language/Level II Optimization (fastest possible).

The Envelope, Please

Running in BASIC 7.0, the bubble sort takes exactly four minutes to sort 100 integers in ascending order. The P-code version did it in only 36 seconds. The fastest possible compilation into ML (the program uses only integer math) took an astounding 14 seconds. And these figures can be halved in the FAST mode.

It's interesting to note the size of the compiled program: a mere two disk blocks for the BASIC program, 38 blocks for the P-code version, and 40 blocks for the ML version. (A more typical example with a 14-block BASIC program resulted in a 74-block ML file and a 50-block P-code file.) Although compiled code can actually be shorter than a very large BASIC program, you'll usually find that the total program size is much larger.

Most of the code expansion can be attributed to the runtime package merged with your program, containing the subroutines used while the compiled program is running, such as the P-code interpreter and the high-speed floating-point routines. However, you can compile programs without the runtime package. By compiling a single line (1 REM), you can generate the runtime package by itself. You can then load the runtime package separately, saving disk space and reducing the disk loading time when you're running many compiled programs.

Other languages, such as C, are designed especially for high-speed compilers, but an expert ML programmer with a good bag of tricks can always leave a compiler in the dust. Until computers become as smart as people, compilers may never be a substitute for writing your own ML, but they'll always be crucial for speeding up high-level languages.

BASIC-128
Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
$59.95

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A Robot Is A Girl's Best Friend

Fred D'Ignazio
Associate Editor

This month I'm turning my column over to Joanna Sisk of Roanoke, Virginia. Ten-year-old Joanna has been living with a robot named Elami Jr. for several months, and she has some thoughts about what life is like with a little mechanical friend.

I was really excited when Mr. D'Ignazio said that I could review this robot. After all, I had only used robots about twice before in my life!

His name is Elami Jr. He's about 11-3/4 inches tall, and is already put together when you get him. He has two arms with grippers. They aren't motorized, but you can move them, so he can still bring things to people. He has a 25-key keyboard on his front; and when you type in a key, he will tell you the command you typed. He has 24 lights and requires four AA batteries and four C batteries.

Elami makes four faces out of liquid crystals, like on a digital watch. His mouth moves when he talks. His four expressions are sleepy, happy, angry, and surprised. When you first turn him on he says, "Hello, I am Elami. Please enter my code," and looks sleepy. If you enter the code (mine is 2222), he looks happy, and you can enter a program. If you leave him on for too long, he gives you an angry look and says, "Please switch me off" in an angry voice.

Elami has two speeds and can go forward, backward, right, left, right curve, and left curve. First you type in either S1 or S2 for speed #1 or speed #2. Then you tell him which way you want him to go, and how many seconds for him to go. Forward 1 in speed 1 makes Elami go forward about six inches, and on speed 2 it's about 10-1/2 inches. Sometimes, it seems like he wants to aggravate you, and even on the same floor you can't depend on him curving correctly. He also doesn't run on a carpet, even a very thin one.

Joanna and her friend Elami Jr.

Elami knows 206 different words, but you can only program him to say 19 words or phrases at a time. He also says other things that you don't program in, such as "Good morning, Master," "Can I help you?," and "Please Enter Program Again." Some of my favorite words to program are "I am happy," "Mommy," "Daddy," "I love you," and "Follow me." He has a British accent and really doesn't sound like a robot at all.

Here are some bad things about Elami. Elami can't have a program that goes on forever and ever. The book says that he won't accept any commands after a certain number are entered. You probably wouldn't have any trouble, though, because I've entered some pretty long programs and Elami wouldn't stop accepting them.

When you read the first part of the book, it makes it sound as if Elami's arms are motorized, so I tried the commands to move the arms a lot of times, and I was afraid that I had already broken him!

Another problem is that Elami really eats up batteries. Once they got used up after only about five days. So if you use him a lot, it can get awfully expensive.

Elami can be used for a lot of different things. One thing is waking up your mother or father. I made a little program sort of like this one—TB, T5, T4, T7, T8, S2, R5, F9. I put Elami in my parents' room while they were sleeping. Elami said, "Hello. I am Elami. Please, Mommy, let's play!" Then he zoomed away in second gear.

Elami can easily surprise people, especially ones who have never seen him, by greeting them at the door. At a party I had, well, I tried to get him to greet my friends at the door. I didn't get him ready in time, but I would have done something like TB, T5, T6, S2, R5, F6, TE, TC. That would make him say, "Hello. I am Elami. Please follow me." Then he would go to the edge of our entrance hall and say, "Have a nice day. Good-bye."

Also, it's easy to dress Elami up in a costume for Halloween or something. I was a clown for Halloween, and I dressed up Elami as my assistant. I gave him a little hat tied on with bright red string, and I tied another bright red string around the middle of him and stuffed cotton on it to make white spots. I also gave him a Joker playing card to hold. The only problem was that sometimes the string holding his hat on would get in front of his eyes, so he only went backwards, trying to get away from the hat, since he thought he would bump into it.

Elami is a really neat robot, and I wish I could keep him. Sometimes robots (and computers) seem like they're alive. Maybe they are.

You can find out more about Elami and other robots by sending for a robot catalog from ROBOTLAND, 1313 Central Terrace, Lakeworth, FL 33460; or call (305) 533-5264. Next month, I'll return with a column on other new robots.

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

Q. In recent issues of COMPUTE!'s GAZETTE I've read about the Commodore 128 and Amiga computers. I'm a 64 owner, and I'm worried about the future of the 64. How long do you expect the 64 to be supported by Commodore, as well as by third-party companies? Even though the 128 and Amiga are great computers, I like my 64 and cannot afford to buy another computer. Should I try to save for an Amiga, or still purchase software for my 64? Please tell me what you think will happen to the 64.

A. We can't speak for Commodore, of course, but it seems likely that support for the 64 will remain strong for the next couple of years. More 64s have been sold than any other computer ever made—at least a million in 1985 alone—and that adds up to a lot of potential customers for hardware and software manufacturers. Almost every piece of software released for the home and educational markets is made available for the 64. The only other machine with a comparable non-business software base is the Apple II series, followed by the Atari 400/800/XL/XE line.

The Commodore 128 actually strengthens the 64's position. Because the 128 can run virtually all 64 software and work with virtually all 64 hardware, the potential market for 64-compatible products can remain stable even if Commodore stops producing the 64. In fact, we've learned that Commodore halted its 64 production lines twice during the fall of 1985 but was forced to restart them due to unexpected demand over the holidays. Even if Commodore discontinues production of the 64 sometime in 1986, the 128's success means that manufacturers will continue introducing 64-compatible products as long as there is sufficient demand. True, some products for the 128 will be designed to work in 128 mode only, but the vast number of 64s encourages manufacturers to tap both markets.

The Amiga is a completely different class of machine. It offers vast amounts of computing power and many fascinating capabilities. Yet, although it's fun to be the first person on the block with a shiny new computer, there's no reason why you *have* to buy a new computer if you don't really need one. A 64 or 128 has plenty of computing power for many people. And no tool becomes really obsolete as long as it continues performing the task you bought it for.

Keep in mind that computers will always be growing more powerful. If there are any limits to computing power, we haven't run into them yet. Even when silicon chips can't get any smaller or cheaper, there is the promise of wholly different technologies: gallium arsenide chips, parallel processors, supercooled Josephson junctions immersed in vats of liquid helium, fiber-optic processors, biocomputers, and on and on. Computer science is advancing so rapidly that any computer you buy is virtually guaranteed to be *technologically* obsolete within a few years. Whether it becomes *functionally* obsolete depends on how fast your needs (or wants) change.

It's still relatively early, but the way the computer market seems to be shaking out indicates that there'll probably be two tiers in the near future: an under-$500 market for home, educational, and some small business users; and an over-$1,000 market for the majority of business users, professionals, and well-heeled hobbyists. In other words, the mature computer market of tomorrow will closely resemble today's markets for camera and audio equipment. Prices will remain roughly the same, but over the years you'll be getting more for your dollar.

Q. How close to my 1701 monitor can I store disks without any degrading effects due to stray magnetic fields?

A. I'd recommend keeping disks at least one foot away from a monitor or TV. Other sources of magnetic fields to watch out for are telephones (especially when they ring), power supplies, electric motors, printers (which contain power supplies and electric motors), and loudspeakers (especially hi-fi speakers with large woofers). Storing your disks in a steel (not aluminum) box is another way to protect them from magnetic harm.

Q. I am trying to translate a BASIC program that was written for an IBM PC. The problem is that for the program to give satisfactory results, it is necessary to use double-precision arithmetic. Is it possible to get double precision on the Commodore 64? If so, how?

A. Sorry, but double-precision variables aren't available in Commodore 64 BASIC. Enhanced BASICs, such as *Simons' BASIC* and *S'more*, don't have double precision, either. Although it's possible to write your own double-precision math routines in machine language, it's a project that could be tackled only by the most advanced ML programmers. Perhaps a reader can suggest a solution.

BASIC magic

One-Dimensional Arrays

Michael S. Tomczyk

This month, we'll begin to explore one of the trickier areas of BASIC programming: arrays. But first, we have a bit of business left over from our previous discussions of READ and DATA—so here's a quick review. First, type in this program:

```
10 DATA 1986,2000,3.14,.13
100 PRINT CHR$(147)
200 FOR X=1 TO 4:READ N:PRINT
    "NUMBER"X"IS"N:NEXT
```

Line 10 lists numbers, separated by commas, as DATA.

Line 100 clears the screen.

Line 200 uses a FOR-NEXT loop to read four items from the list, and uses those items in the PRINT statement. The individual numbers appear where the N appears in the PRINT line. The X in the sentence comes from the FOR-NEXT loop, which acts like a counter. You can use *any* numeric variables, including or instead of X and N.

Now type NEW and press RETURN.

This example uses various types of *string information* with READ and DATA:

```
10 DATA COMPUTER,BASIC
   MAGIC,333-666-4444,—
100 READ A$:PRINT A$"...IS A WORD."
200 READ B$:PRINT B$"...IS A
    PHRASE."
300 READ C$:PRINT C$"...IS A SERIAL
    NUMBER."
400 READ D$:FOR G=1 TO 22:PRINT
    D$;:NEXT
500 PRINT D$"...IS A GRAPHICS
    SYMBOL."
```

Line 10 contains the DATA list. Line 100 reads the first item from the list, defines it as A$ and uses it in the PRINT statement.

Line 200 reads the next item, defines it as B$ and uses it.

Line 300 defines the third item as C$.

Line 400 defines the graphics symbol as D$ and uses a FOR-NEXT loop to draw a horizontal line across the screen. FOR-NEXT is used to *repeat* actions or to *count*—in this line we repeat the horizontal line graphics symbol 22 times across the screen, which connects them into one long horizontal line.

Line 500 uses the symbol (D$) again.

Our final READ and DATA example demonstrates how to mix and match string and numeric variables in the same program:

```
10 DATA TEN,10,TWENTY,20,THIRTY,
   30,FORTY,40,FIFTY,50,-1,-1
100 PRINT CHR$(147)"LET'S COUNT
    TO 50 BY TENS"
200 READ N$,N:IF N=-1 THEN END
300 PRINT N" ... "N$
400 GOTO 200
```

Line 10 contains the DATA.

Line 100 clears the screen and displays a PRINT message. (Note that we need only one PRINT command at the beginning of the line).

Line 200 reads two variables: first a string variable (TEN), then a numeric variable (10). It also checks for an *end-of-program-marker*, which tells the computer IF N equals −1, THEN END the program. By putting two −1's at the end of the DATA, we give the computer a marker or flag it can look for when it runs out of DATA to read. If you don't include one, the computer will keep trying to READ DATA and cause an OUT OF DATA error. We use two −1's here because we're reading two DATA variables.

Line 300 prints the two variables, one pair at a time. Notice variables like N and N$ are always printed outside quotation marks—but we have to put our three punctuation dots inside quotation marks.

Creating An Array

An *array* is a group of items—usually arranged as a chart or as a table of words or numbers. The notation used with arrays is very similar to that used with string and numeric variables. For example, the following program uses numeric variables F1, F2, and F3:

```
10 F1=365:F2=12:F3=52
20 PRINT F1" DAYS,"F2"
   MONTHS,"F3" WEEKS."
```

Array notation is slightly different. For example, we'll use F(1), F(2), and F(3) instead of F1, F2, and F3. To modify the program, LIST it, then change it to the following and type RUN.

```
10 F(1)=365:F(2)=12:F(3)=52
20 PRINT F(1)"DAYS,"F(2)"MONTHS,
   "F(3)"WEEKS."
```

Line 10 defines three items: F(1), F(2), and F(3). By defining these numbers like variables but using parenthesis, you caused your computer to automatically reserve 11 locations—and only 11—in an array called "F." Since we used only three locations, we could have put eight more in this array—but no more than 11. (We'll see how to get more than 11 in a moment.)

Line 20 takes the numbers from the array locations defined in line 10, and prints them as shown. How is this different from using regular variables like A1 or F1? Well, as soon as you define an array, your computer automatically makes room for *exactly* 11 items. The array we created is called F, so the computer reserves 11 areas, labeled F(0) to F(10).

Each location is like a box. One location can contain one number. Let's stop a moment and test the computer to see if it reserved exactly 11 items. Add this line, then run the program to see if it works:

```
30 F(12)=4
```

It doesn't work. You get a BAD SUBSCRIPT ERROR—no more than 11 items can be used in an array. This means you can't use array names like F(12), F(20), F(100), or anything larger than F(10) because the computer won't accept it.

Wait a minute—computers process huge amounts of information. There must be some way to create a larger array, right? There is. To create an array which contains

more than 11 items, you must use another command.

The DIM Command

You can tell the computer to set aside space for a much larger array by using the DIM command. DIM stands for dimension. We talk about dimensioning an array because an array can have several dimensions (as we'll see next month).

To DIMension an array to hold more than 11 items—let's say you want to include 20 numbers—simply type: DIM A(19).

The A defines the name of the array, and the 19 in parentheses is one less than the number of spaces you've reserved for the numbers you want to include. Try this program, which puts 20 numbers, numbered from 200 to 219, in an array defined as A.

```
10 DIM A(19)
20 FOR X=0 TO 19:A(X)=200+X:PRINT
   "A("X")="A(X):NEXT
```

Line 10 DIMensions the array. That is, it creates an array called A and reserves 20 places or "boxes" numbered A(0) to A(19). The reason the computer starts at A(0) is because (unlike us humans) your computer *always* starts counting at 0 instead of 1.

Line 20 uses a FOR-NEXT loop to count from 0 to 19, then borrows the X from the counter to define A(X). For example, when the loop begins counting at 0, A(0)=200+0, so array position A(0) equals 200. On the next loop, X equals 1, so A(1)=200+1. This means the array position A(1) equals 201, and so on. At the end of the line, we print the entire array so you can see how it is defined.

READ-DATA And ARRAYS

You can also use READ and DATA to put information into an array. The usefulness of this technique is that DATA can only be read sequentially or cleared and READ with a FOR-NEXT loop. Putting the DATA into an array allows you to READ and use the DATA one item at a time, or in any order you like.

Try this example:

```
10 DIM A(20)
20 DATA 0,1,2,3,4,5,6,7,8,9,10,11,
   12,13,14,15,16,17,18,19
30 FOR X=1 TO 20:READ A(X):PRINT
   "A("X")="A(X):NEXT
```

The result is slightly different because we listed the numbers from 0 to 19 and defined A(X) as values from 0 to 19. You cannot easily change the size of an array after it's DIMensioned, but you can *redefine* any of the items in the array. For example, to change the items in this list from 0, 1, 2, 3, etc., to 200, 201, 202, 203, etc., change line 30:

```
30 FOR X=1 TO 20:READ A(X):A(X)
   =200+A(X):PRINT"A("X")=
   "A(X):NEXT
```

See what we did? After READing A(X), which defines the array element, we redefined it by adding 200. Now, when we PRINT out the array, everything has been increased by 200. You can also change individual items. Try adding line 40 like this:

```
40 A(17)=2000:PRINT"A(17)="A(17)
```

Run the program. Now element A(17) equals the number 2000, as you've redefined it. The other numbers are unchanged.

String Information In Arrays

So far we've been working only with numeric arrays. But, you can create string arrays as well.

Let's begin with a small array (less than 11 items) which does not require a DIMension command. Type NEW, then try this program:

```
10 C$(1)="GREEN":C$(2)="RED"
   :C$(3)="ORANGE"
100 PRINT C$(1)" IS THE COLOR OF
    SHAMROCKS."
200 PRINT C$(2)" IS THE COLOR OF
    ROSES."
300 PRINT C$(3)" IS THE COLOR OF
    ORANGES."
```

So far, you could just as easily have used regular variables like C1$ or C2$ to define the three colors, right? Now try this variation:

```
10 DATA GREEN,RED,ORANGE
100 READ C$(1),C$(2),C$(3)
200 PRINT C$(1)" IS THE COLOR OF
    SHAMROCKS."
300 PRINT C$(2)" IS THE COLOR OF
    ROSES."
400 PRINT C$(3)" IS THE COLOR OF
    ORANGES."
```

Note that you could put any list of words or phrases into a DATA list, define them in an array by READing them as we did in line 100, then use the DATA in your program. Note the new way of READing DATA: simply by listing the items to be READ, with commas, as shown. Type NEW to erase the program.

Here's a more familiar bit of program which may give you some insight into how adventure games are set up:

```
10 DATA GOLDEN BELL,DIAMOND
   JEWEL,WORKMAN'S AX,SIX
   FOOT SPEAR
200 READ C$(1),C$(2),C$(3),C$(4)
300 R=INT(4*RND(1))+1
400 GET K$:IF K$="" THEN 400
500 PRINT CHR$(147)"MORLOCK
    GIVES YOU A"C$(R):GOTO 300
```

Line 10 contains a DATA list of four phrases. Notice that you can include phrases (including spaces) and sentences in DATA lists.

Line 200 causes the computer to set up an array containing string information. We'll define four "boxes" in the array. The items in the DATA list are always defined in the order in which we READ them, so C$(1) automatically becomes GOLDEN BELL, C$(2) is DIAMOND JEWEL, and so on.

Line 300 is a random number formula which randomly selects a number from one to four and defines that number as the numeric variable R. From now on, R stands for a number from one to four which the computer has selected at random.

Line 400 is a key checking routine. This line tells the computer to check to see if a key is being pressed. If none is, it tells the computer to keep going back (to the same line 400). The computer will stay in an "endless loop" checking the keyboard over and over until and unless one of the keys is pressed.

Line 500 clears the screen, then prints a sentence. At the end of the sentence, the last phrase is represented by C$(R). Remember, R is now a random number from 1 to 4, so C$(R) could be any of the phrases from the DATA list. Finally, the computer is instructed to GOTO line 300, which selects a new random number and drops down to line 400, which patiently waits for you to press another key.

To see the program work, type RUN and press RETURN, then press a few keys to see what happens. You could use this technique in a real adventure program, but instead of going back to get another item from Morlock, you would keep the item (at least until some evildoer took it away from you).

This finishes our introductory look at one-dimensional arrays. Next month, we'll look further into arrays and how they work, and take a crack at two and three-dimensional arrays as well.

Plummer Hensley

This short utility spices up your programs by adding a blink and a click to the PRINT command. Anytime you type a character to the screen, you'll see an underline cursor accompanied by a brief sound. For the 128, 64, Plus/4, 16, and VIC.

If you don't think sound is important, try playing your favorite action game with the volume turned all the way down. It's just not as much fun without the explosions, zaps, and other noises.

Sounds help to liven up games, so why not make PRINT statements a little more interesting? This program gives you a blink and a click (a "blick") every time a character is printed.

Typing It In

Enter the version written for your computer and save it to tape or disk before proceeding. Saving is important because the last command in line 120 is a NEW, which erases the program currently in memory.

"Blick" is written in machine language (ML), but you don't need to know ML to use it. It is presented in the form of a BASIC loader that reads DATA statements and POKEs the routine into memory. After running it, you should see the message BLICK ENABLED.

Once Blick is in memory, try printing a message, PRINT "THIS IS BLICK", for example. Or load a program and list it. See the table below for ideas on customizing the program.

If you should accidentally disable Blick by pressing RUN/STOP–RESTORE or RUN/STOP–RESET, enter the appropriate SYS from the table to re-enable Blick. To turn it off, enter the two POKEs listed (Note: enter them on the same line, separated by a colon). To change the cursor character, POKE the appropriate ASCII value into the location listed. Finally, the blinking speed can be modified with a POKE to the address specified in the table.

How It Works

Blick is a "wedge" that temporarily diverts the PRINT command into a routine that prints an underline character, makes a sound, and erases the underline. When it's finished, it goes on to the main PRINT command.

PRINT is a common, easy-to-use command in BASIC. But at the machine language level, PRINT is more complex; it has to do a lot of work. First, the computer looks ahead to see whether it will be printing a variable, a number, a string, or maybe even a long calculation. Once that's straightened out and BASIC knows the sequence of characters to be printed, it goes through the Kernal routine for printing characters (always at location $FFD2 on the 128, 64, Plus/4, 16, and VIC). The Kernal routine looks at locations 806–807 (804–805 on the Plus/4 and 16) to find the actual ROM routine for printing a character.

This pointer was deliberately designed to be the weak link in the process. If we change the address there, anytime the computer wants to print a character, it runs into a detour we have set up. This detour handles the blink and the click before jumping back to the main PRINT routine.

A word of caution: The 64 version of Blick is subject to the infamous lockup bug which affects version 2 of ROM. To see if your 64 has version 2 of the operating system, start with a newly powered up 64 and put the cursor at the bottom of the screen. Hold down the space bar until it travels across two complete screen lines. After the cursor has wrapped around to the beginning of the next line exactly twice, use the DELete key to move it back to the end of the previous line. If the screen says LOAD and the computer locks up, you've got version 2 ROM. This lockup happens only when the cursor color is red, cyan, blue, yellow, light red, dark gray, light blue, and light gray. If you limit character colors to black, white, purple, green, orange, brown, medium gray, and light green, you'll be safe. It's also a good idea to limit your printing to strings of 79 characters or less.

See program listings on page 105.

Important Blick Locations

	64	128	Plus/4,16	VIC
Enable	SYS 679	SYS 3072	SYS 1015	SYS 673
Disable	POKE 806,202: POKE 807,241	POKE 806,121: POKE 807,239	POKE 804,75: POKE 805,236	POKE 806,122: POKE 807,242
Change cursor (POKE location with any ASCII value (X))	POKE 728,X	POKE 3128,X	POKE 1056,X	POKE 704,X
Change blinking speed (POKE location with 0-255 (Y); numbers greater than 234 speed up cursor)	POKE 733,Y	POKE 3133,Y	POKE 1061,Y	POKE 709,Y

machine language for beginners

Richard Mansfield
Senior Editor

People unfamiliar with computer programming frequently have the mistaken idea that programming is fundamentally a mathematical activity. It's not, of course; it's not even a derivative of science or math. Programming is a new, unique activity, part talent, part logic, part common sense and patience. Many excellent programmers have had minimal math training.

Likewise, people unfamiliar with machine language programming often assume that it, at least, must require a strong math background. But, again, this assumption is unwarranted. Calculations involving trigonometry or other advanced mathematical manipulations are best done in a higher-level language like BASIC where provision is made for SIN and COS and so forth. Also, floating point arithmetic (where your calculations require that a decimal point be available) is easiest via higher-level languages.

All the math you'll need to program ML will likely be limited to *arithmetic:* multiplication, division, addition, and subtraction. And you'll use no decimal points nor, surprisingly, any negative numbers. A number with no decimal point is called an *integer* and in ML programming you'll be more or less exclusively concerned with performing arithmetic on simple, positive integers.

Let's see how to accomplish this arithmetic. The fundamental arithmetic unit in 6502 ML programming is the *byte* which can represent or "hold" any number between 0–255. If you PRINT PEEK (1098), to take a random memory location, you might find that this address, this byte, held a 5 or a 173, but you'll never find that it had a −2 or 264. Those numbers are beyond the range of a byte.

To add two bytes together, use the ADC instruction which means *ADd with Carry.* Let's try it:

```
10 LDA  #4
20 CLC
30 ADC  #3
```

After this, the accumulator will hold the result, 7. The CLC clears the carry flag and should always be included in your programs just before any addition. The carry flag flies up when the result of an addition goes beyond 255 *and the remainder is left in the accumulator, not the total.* The total, when the carry flag is up, is 256 plus the remainder left in the accumulator. Thus, if your addition is likely to result in a number bigger than one byte can hold (bigger than 255) you need to take a different approach and utilize another common ML unit: two consecutive bytes. With two bytes, we can count up to 65535 (one of the bytes will represent multiples of 256 and the other byte will represent the remainder). Here's how to do double-byte addition:

```
10 CLC
20 LDA  6000
30 ADC  7000
40 STA  6000
50 LDA  6001
60 ADC  7001
70 STA  6001
```

This assumes that there were two, two-byte units being added together: one in addresses 6000 and 6001 and the other in addresses 7000 and 7001. The result of the addition is left in addresses 6000 and 6001. To add 255 + 255, you would first put 255 into each unit:

```
5 LDA   #255
6 STA   6000
7 STA   7000
8 LDA   #0:STA 6001:STA 7001
```

The result of all this would be 254 in 6000 and a 1 in 6001 (this location is the *most significant byte,* the one considered to be holding a multiple of 256).

Subtraction is similar to addition, however, you use SEC to SEt the Carry flag just prior to any subtraction:

```
LDA  #9
SEC
SBC  #7
```

would leave the result, 2, in the accumulator. Two-byte subtraction also follows the pattern used for addition:

```
10 SEC
20 LDA  6000
30 SBC  7000
40 STA  6000
50 LDA  6001
60 SBC  7001
70 STA  6001
```

We have subtracted the double-byte number in 7000–7001 from the double-byte number in 6000–6001 and left the result in 6000–6001.

Multiplication can be accomplished by putting an addition routine within a loop and repeatedly adding. To multiply something by five, just run through the loop five times:

```
 5 LDX #5
10 LDA #0
20 CLC
30 LOOP ADC #3
40 DEX
50 BNE LOOP
```

This would leave the result of 5 × 3 in the accumulator.

However, there's an elegant way to multiply involving the ASL instruction if one of the numbers involved is a power of two (2, 4, 8, 16, 32, etc.).

This technique, along with division and multiple-byte arithmetic, isn't much more complicated than single- or double-byte arithmetic. We'll look at all of these topics next month.

news & products

3-D Graphics

Graph-Tech Software Co. has announced an upgraded version of its *3-D World 64* graphics program for the Commodore 64 and 128. The graphics package has been expanded to include support of dot matrix printers.

The original version of the program enables Commodore 64 users to create complex, three-dimensional wireframe graphics, including rotation, zoom, and translation of all 3-D objects. The new Version 4.0 contains a module which permits hardcopy screen dumps on most popular dot-matrix printers. It also cuts drawing time by 200 to 500 percent and allows saving and loading of individual screens to and from the disk.

The upgraded version of *3-D World 64* retails for $39.95. Present owners of *3-D World 64* can obtain the Version 4.0 for $10.

Editron Software Systems, 165 West 47th St., Suite 4D, New York, NY 10036.

Circle Reader Service Number 220.

Gato For The 64

Spectrum HoloByte has released the Commodore 64 version of *Gato*, a World War II submarine simulation game. This game puts you in the captain's seat of a "Gato" class submarine where you must carefully plan your strategy to avoid being sunk.

The Commodore version includes eight missions, five difficulty levels, and three ships. *Gato* takes advantage of the 64's sound capabilities by incorporating digitized voices and submarine sound effects into the game.

Earlier versions of the game are for the Apple and IBM.

Gato for the Commodore 64 is priced at $29.95.

Spectrum HoloByte, Inc., 1050, Suite 325, Boulder, CO 80302.

Circle Reader Service Number 221.

Intelligent I/O For Commodore

Intelligent I/O, Inc., has released its new BH100 General Purpose I/O Card for the Commodore 64, 128, and VIC-20. The card plugs into the memory expansion port and provides a total of eight, eight-bit parallel ports. Data is sent or retrieved by a single POKE or PEEK command.

The card can be used for controlling lights, appliances, motors, and any electrical device or for high speed data acquisition, automated testing/experimentation, and security systems. It can also be connected to analog-to-digital and digital-to-analog converters.

Suggested retail price is $129.

Intelligent I/O, Inc., 30 Lawrence Ave., Potsdam, NY 13676.

Circle Reader Service Number 222.

Combat Simulation

Survival, from Infinity Software, is a futuristic combat simulation game for the Commodore 64. This two-player game takes place on a lonely planet in a far-flung galaxy in the year 2044, combining chess-like strategy with standard war-gaming. You and your opponent command the RED and BLUE armies as you battle for the survival of your civilizations.

Survival is available on disk for $25.

Infinity Software, 536 Curie Dr., San Jose, CA 95123.

Circle Reader Service Number 223.

128 CP/M Word Processor, Spreadsheet

Pocket WordStar (with MailMerge) and *Pocket CalcStar* for the Commodore are now being distributed in the U.S. by Davis Rubin Associates. Both *Pocket WordStar* and *Pocket CalcStar* are full implementations of the original MicroPro programs.

Pocket WordStar with *MailMerge* is priced at $189 and *Pocket CalcStar* costs $89.

Davis Rubin Associates Ltd., P.O. Box 595, King of Prussia, PA 19406.

Circle Reader Service Number 224.

128 And 64 Accounting System

Clockwork Computers, Inc., has announced its *CCI Bottom Liner* (80-column mode) accounting system for the Commodore 128. It's also available for the 64 in 40-column mode.

This accounting system for home and small business allows the user to define up to 700 accounts and includes spreadsheets, voucher check writing, a client file, and production of mailing stickers.

The *CCI Property Rental* version adds to the accounting system a property file for up to 500 units with descriptions of features for rental searches.

Another version, *CCI Mortgage Management*, provides a property file for up to 400 mortgages with full data on basic aspects of a mortgage, an internal bookkeeping system, and amortization schedules in addition to the accounting system.

Prices vary from $75.95 to $154.95, depending on your equipment.

Clockwork Computers Inc., 4612 Holly Ridge Rd., Rockville, MD 20853.

Circle Reader Service Number 225.

128 Financial Planner, Enhanced Word Processor

Timeworks has released the Commodore 128 version of *Sylvia Porter's Personal Financial Planner* and an enhanced *Word Writer 128*.

The Personal Financial Planner 128 takes advantage of the new features of the Commodore 128 and includes an electronic checkbook and checkwriting, budget preparation, tax aids, financial statement preparation, and financial inventory tracking.

The upgraded *Word Writer 128* is an 80-column word processing system for home and business use and works in 128 mode with either a 40- or 80-column monitor. Its new features include on-screen highlighting, right margin justification, superscript and subscript, headers and footers, and speed keys. *Word Writer 128* can be interfaced with the *Personal Financial Planner 128*.

The programs retail for $69.95 each. Backup disks are available for Timeworks registered users for $14.70.

Timeworks Inc., 444 Lake Cook Rd., Deerfield, IL 60015.

Circle Reader Service Number 226.

Utility Kit For 64

The *Vorpal Utility Kit*, introduced by Epyx, is designed to enhance the Commodore 64 and 128 and make them easier to use.

The *Kit* features a head realignment utility which remedies many head alignment problems for the Commodore 1541 disk drive, and a file recovery utility which recovers lost or damaged files. The *Vorpal Utility Kit* also includes the Vorpal Save and Load feature, which allows programmers to incorporate the *Vorpal Fast File* loading utility into their own programs. In addition, fast-formatting and fast-disk backup utilities reduce the time needed to load, format, and copy disks.

The *Vorpal Utility Kit* is available from retailers for $24.95 to $34.95.

Epyx, Inc., 1043 Kiel Ct., Sunnyvale, CA 94089.

Circle Reader Service Number 227.

Home Inventory Program

How much is your personal property worth? *What's Our Worth?* from Adita Enterprises is a home inventory package for the Commodore 64 that helps you keep track of your personal belongings and their value.

The menu-driven program allows you to enter items into your inventory, search for specific information, change or delete items, make a backup data disk, and view the disk directory. A 20-page user manual is included.

The program is marketed in Canada by mail order for $19.95.

Adita Enterprises, Inc., 116 Bermondsey Way NW, Calgary, Alberta, Canada T3K 1V4.

Circle Reader Service Number 228.

New Commodore Games

CYGNUS has released a new line of software for the Commodore 64 and 128. *Star Fleet I* is a strategy game, previously available for the IBM PC. *QUIZAM!* is a computer trivia game, and *Stinger!* is a space arcade game for younger players.

Star Fleet I retails for $49.95, *QUIZAM!* for $39.95, and *Stinger!* for $19.95.

CYGNUS, P.O. Box 57825, Webster, TX 77598.

Circle Reader Service Number 229.

Computer Board Game

King Chip from XYLYX Computer Entertainment Limited is a new trivia board game about computers and computing for two to six players. The game package includes six playing boards, a die, various markers, and 675 cards containing 4,050 questions and answers. You don't need a computer to play the game.

The object of *King Chip* is to gain the throne and hold it for as long as possible. Gaining and holding the

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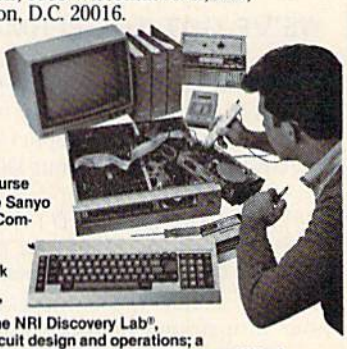

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throne depends on your ability to answer the questions. There are six categories of questions: data communications, history and current events, hardware, jargon and acronyms, potpourri, and software.

King Chip retails for $39.95 and is marketed in the U.S. by Ingram Software, Inc., 2128 Elmwood Ave., Buffalo, NY 14207. *XYLYX Computer Entertainment Limited, 20 Torbay Rd., Markham, Ontario, Canada L3R 1G6.*

Circle Reader Service Number 230.

Computer Golf Game

The world-famous Pebble Beach Golf Links course is recreated in hi-res color graphics in *Championship Golf at Pebble Beach*, a new game for Commodore 64/128 computers from Sportsware. The game features variable tee placements and pin positions, scorecard printout, and a bird's-eye view of the course, including tees, fairways, greens, sand traps, the Pacific Ocean, and a close-up of the green for putting. There are two skill levels and a choice of 14 different clubs.

Data disks for Augusta National and the Tournament Players Club are also available.

Championship Golf at Pebble Beach is available on disk for $24.95 prepaid or $27.95 C.O.D.

Sportsware, 5234 War Wagon Dr., San Jose, CA 95136.

Circle Reader Service Number 231.

Financial Software

Aspen Glen Software has introduced the *Mutual Fund Prospector*, a software program for the Commodore 64 to aid you in planning your financial investments. The program allows you to identify new potential investments and helps you determine when to change your portfolio.

The *Mutual Fund Prospector* is available for $49.95.

Aspen Glen Software, 878 Jackman St., Suite 157, El Cajon, CA 92020.

Circle Reader Service Number 232.

"Disk Drive" A Chevrolet With Your Commodore 64

General Motors has devised a rather unique way for personal computer owners to calculate the cost of a new 1986 Chevy car or truck. The *Chevy Tech* disk begins by playing the Chevy theme song, then lets you choose a vehicle from the entire 1986 line of cars and light-duty trucks. The program then displays basic information about that model and lists optional equipment and prices, providing a running tally of suggested retail price. Once you're comfortable with a particular configuration, a finance calculator helps determine the monthly payments, based on varying interest rates, payment periods, trade-in allowances, and other variables.

The program also includes a short game called *Depreciation Derby*, in which you race against the clock to get your 12 used cars to the dealer for a trade-in. The value of the cars drop as you try to run the obstacles and time passes.

Chevy Tech is available for the Commodore 64 through mail order for $3 (Please specify in a letter what kind of computer you have).

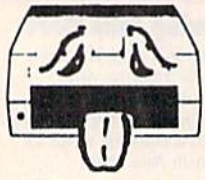
Chevy Tech, P.O. Box 2054, Warren, MI 48090-2054.

Circle Reader Service Number 233.

New Software from SSI

Strategic Simulations Inc. has introduced a number of new games for the Commodore 64 and 128.

Battlegroup is a tactical-level, historically accurate simulation of all the major engagements of WWII from North Africa in 1943 to the war's end in Germany. This sequel to *Kampfgruppe* has four historical scenarios with three levels of difficulty. For the Commodore 64. ($59.95)



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Rings of Zilfin is a role-playing, fantasy adventure game which uses animated window graphics and clues to help you in your search for the Rings of Zilfin. You use magic, weapons, spells, the balance of forces, as well as the economic situation to fight 26 different kinds of monsters. For the Commodore 64 and 128. ($39.95)

Wizard's Crown combines detailed war-game-type tactical battles with the magic and mystery of a fantasy quest. In this adventure game you can create a multitude of characters that move singly or collectively. *Wizard's Crown* is for intermediate players on the Commodore 64. ($39.95)

Strategic Simulations Inc., 883 Stierlin road, Bldg. A-200, Mountain View, CA 94043-1983.

Circle Reader Service Number 234.

Source Code Generator For 128

OMNICodeI is a source code generator (a program that creates programs) which writes BASIC programs and subroutines to handle screen formatting, input, and compiled output. The code generated is completely modular, well REMarked, and compiler-compatible.

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The Commodore 128 version requires at least one 1541 or 1571 disk drive and an 80-column display (either color or monochrome). It writes Commodore BASIC 7.0, and is compatible with the BLITZ!-128 BASIC Compiler from Skyles Electric Works. Retailing for $89.95, the package includes *OMNI-Merge-128*, which allows the user to merge tokenized BASIC programs and subroutines.

OMNISoft & Associates, P.O. Box 280, Rogers, AZ 72756.

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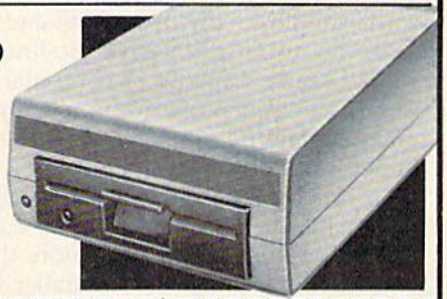

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COMPUTE!'s GAZETTE Author Guide

Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, 16, and VIC-20. We are much more concerned with the content of an article than with its style, but articles should as be clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403) it will take from two to four weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact our Features Editor for details.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

MLX Machine Language Editor For The Commodore 64

Ottis Cowper
Technical Editor

"MLX" is a labor-saving utility that will help you enter machine language program listings without error. MLX is required to enter all Commodore 64 machine language programs published in COMPUTE!'s GAZETTE. This version of MLX was first published in the January 1986 issue; it cannot be used to enter MLX programs published prior to that date, nor can earlier versions of MLX be used to enter the listings in this issue.

Type in and save a copy of MLX. You'll need it for all future machine language programs in COMPUTE!'s GAZETTE, as well as machine language (ML) programs in our companion magazine, COMPUTE!, and COMPUTE! books. When you're ready to enter an ML program, load and run MLX. It asks you for a starting and ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing. If you're unfamiliar with ML, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, MLX offers the option of clearing the workspace. The data you enter with MLX is kept in a special reserved area of memory; clearing this workspace area fills the reserved area with zeros, which will make it easier to find where you left off typing if you enter the listing in several sessions. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session there's no point in clearing the workspace, since the data you load in will fill the area with whatever values were in workspace memory at the time of the last Save.

At this point, MLX presents a menu of commands:

```
Enter data
Display data
Load data
Save file
Quit
```

Press the corresponding key to select a menu option. These commands are available only while the menu is displayed. You can get back to the menu from most options by pressing RETURN.

Entering A Listing

To begin entering data, press E. You'll be asked for the address at which you wish to begin. (If you pressed E by mistake, you can return to the command menu by pressing RETURN.) When you begin typing a listing, enter the starting address here. If you're typing in a long listing in several sessions, you should enter the address where you left off typing at the end of the previous session. In any case, make sure the address you enter corresponds to the address of a line in the MLX listing. Otherwise, you'll be unable to enter the data correctly.

After you enter the address, you'll see that address appear as a prompt with a nonblinking cursor. Now you're ready to enter data. To help prevent typing mistakes, only a few keys are active, so you may have to unlearn some habits. MLX listings consist of nine columns of two-digit numbers—eight bytes of data and a checksum. You *do not* type spaces between the columns; the new MLX automatically inserts these for you. Nor do you press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit. The only keys needed for data entry are 0–9 and A–F. Pressing most of the other keys produces a warning buzz.

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only *before* any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

Beep Or Buzz?

After you type the last digit in a line, MLX calculates a checksum from the line number and the first eight columns of data, then compares it with the value in the ninth column. The formula (found in lines 370–390 of the MLX program) catches almost every conceivable typing error, including the transposition of numbers. If the values match, you'll hear a pleasant beep, the data is added to the workspace area, and the prompt for the next line of data appears (unless the line just entered was the last line of the listing—in which case you'll automatically advance to the Save option). But if MLX detects a typing error, you'll hear a low buzz and see an error message. Then MLX redisplays the line for editing.

To edit a line, move the cursor left and right using the cursor keys. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. To make corrections in a mistyped line, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Other MLX Functions

The Display data option lets you review your work. When you select D, you'll be asked for a starting address. (As with the other menu options, pressing RETURN at this point takes you back to the command menu.) Make sure the address corresponds to a line from the listing. You can pause the scrolling display by pressing the space bar. (MLX finishes printing the current line before halting.) To resume scrolling, press the space bar again. The display continues to scroll until the ending address is reached, then the menu reappears. To break out of the display and return to the menu before the ending address is reached, press RETURN. A quick way to check your typing is to compare the reverse video checksums on the screen with the data in the rightmost column of the printed listing. If the values match, you can be sure the line is entered correctly.

The Save and Load menu options are straightforward. First, MLX asks for a filename. (Again, pressing RETURN at this prompt without entering anything returns you to the command menu.) Next, MLX asks you to press either T or D for tape or disk. If you notice the disk drive starting and stopping several times during a load or save,

don't panic; this behavior is normal because MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. For disk, the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. (This also precludes the use of @ for Save-with-Replace, so remember to give each version saved a different name.) MLX saves the entire workspace area from the starting to ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports any errors detected during the save or load. (Tape users should bear in mind that the Commodore 64 is never able to detect errors when saving to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you originally specified. If you get one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct ending address.

The Quit menu option has the obvious effect—it stops MLX and enters BASIC at a READY prompt. Since the RUN/STOP key is disabled, Q lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. (Such programs usually have 0801 as their MLX starting address.) Others must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. (On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000.) In any case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

By the time you finish typing in the data for a long ML program, you'll have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type in MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. (Incidentally, MLX is included every month on the GAZETTE DISK.) Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in MLX cost you several nights of hard work.

MLX

For instructions on entering this listing, refer to "How To Type In COMPUTE!'s GAZETTE Programs" elsewhere in this issue.

```
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB300:SA=A
       D:GOSUB1040:IF F THEN18
       0
GF 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
       300:EA=AD:GOSUB1030:IF
       {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
       R WORKSPACE [Y/N]{4}";A
       $:IF LEFT$(A$,1)<>"Y"TH
       EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
       ING...";:FORI=BS TO BS+
       EA-SA+7:POKE I,0:NEXT:P
       RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {DOWN}{4}":
       PRINT T$"{RVS}E{OFF}NTE
       R DATA"
ED 230 PRINT T$"{RVS}D{OFF}ISP
       LAY DATA":PRINT T$"
       {RVS}L{OFF}OAD DATA"
JS 240 PRINT T$"{RVS}S{OFF}AVE
        FILE":PRINT T$"{RVS}Q
       {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
       MID$("EDLSQ",I,1)THEN A
       =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
       90,700,280:GOSUB1060:GO
       TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
       T"{DOWN}{4}ARE YOU SURE
        [Y/N]";A$:IF LEFT$(A$,
       1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
       LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
       =MID$(IN$,3):GOSUB320:A
       D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
       $(B$,J,1):B=ASC(A$)-C4+
       (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
       0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
       H$,B+1,1);:B=A-B*C6:PRI
       NT MID$(H$,B+1,1);:RETU
       RN
RR 360 A=INT(AD/Z6):GOSUB350:A
       =AD-A*Z6:GOSUB350:PRINT
       ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
       CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       {4}";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
```

```
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
KH 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF
      {SPACE}ST AND(I<>B)THEN
       F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
AX 950 POKE147,0:SYS 63562:IF
      {SPACE}ST<>64 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248)THEN GOSUB1080:F=0
      :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
       {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN
```

bug-swatter

Modifications And Corrections

• "Cataloger" (March) included modifications for the 128. If you change the number 800 to 2000 in lines 10 and 370, you should also make this change in line 920. Thanks to reader William J. Eline for finding this correction. In addition, line 360 of the program (all versions) crashes when it encounters a single disk file containing 100 or more blocks and a filename 16 characters long. The following line fixes this bug:

```
SX 360 B$(C)=B$(C)+LEFT$(S$,20
       -LEN(B$(C))-LEN(NM$))+N
       M$+"{2 SPACES}"+DN$
```

• The "Banners" (December 1985) program modifications for the 1526 and MPS-802 suggested changing CHR$(8) to CHR$(32) in lines 360 and 390. This same change should also be made to line 480 (64 and Plus/4 versions) or 460 (VIC version).

• The 64 version of "Custom Labels" (February) should work correctly, but if you own a Plus/4 or 16, some additional changes are required. As stated in the article, the number 1026 in line 200 should be changed to 3074, and the 1035 in line 210 should be changed to 3083. These same changes apply to lines 400–410 and 490–500.

• The printer that made the listing of *Program 2: Menu* from "128 Autoboot" (March) inserted an extraneous question mark in line 120. To fix it, remove the question mark from between the 1 and the 3 in CHR$(13). The same kind of error appears in line 66 of Program 4 ("Mountain Demo") of "The Coordinator." It has no effect on the running of the program, but will affect the checksum when you're typing it in.

• A portion of the program listing under *Sound Effects For PRINT* (page 16 of "Gazette Feedback," January) was apparently folded under when printer's negatives were made. Missing from the listing are the final line number (80), the first D of DATA, and part of the number 104 (the fourth number from the end).

Arcade Baseball

Article on page 38.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
KB 10 POKE56,48:POKE55,0:CLR:G
      OSUB780
AP 20 PRINT"{7 DOWN}"SPC(14)CH
      R$(14)"{4}PLEASE WAIT
      {8 UP}"
EC 30 FORA=49152TO49999:READB:
      POKEA,B:C=C+B:NEXT
EE 40 IFC<>104062THENPRINT"
      {CLR}DATA ERROR":STOP
FK 50 DATA 173,4,220,141,166,3
      ,169,18,141,5,212,169,10
      0,141,1,212,169,0,133
MQ 60 DATA 187,133,188,133,189
      ,173,30,208,32,199,192,1
      69,0,141,167,3,32,85,193
XB 70 DATA 32,15,194,32,254,19
      4,32,182,194,32,15,194,1
      73,120,3,201,250,208,8
AX 80 DATA 169,0,141,162,3,76,
      152,192,174,167,3,208,11
      4,201,76,176,220,201,69
AG 90 DATA 144,216,169,27,141,
      163,3,169,37,141,164,3,1
      62,7,173,100,3,205,163
JH 100 DATA 3,144,8,205,164,3,
       176,3,76,38,192,173,163
       ,3,24,105,24,141,163
GC 110 DATA 3,173,164,3,24,105
       ,24,141,164,3,202,16,21
       9,169,2,141,21,208,173
JB 120 DATA 100,3,56,233,9,162
       ,255,232,56,233,24,176,
       250,189,175,192,141,162
       ,3
XA 130 DATA 120,169,240,141,26
       ,208,169,49,141,20,3,16
       9,234,141,21,3,169,129,
       141
GA 140 DATA 13,220,88,96,1,5,2
       ,5,3,5,2,5,1,201,30,240
       ,3,76,38
DR 150 DATA 192,169,4,141,162,
       3,76,152,192,169,2,141,
       21,208,169,1,141,28,208
BF 160 DATA 160,7,169,0,153,11
       0,3,136,16,248,169,90,1
       41,101,3,169,230,141,12
       1
QH 170 DATA 3,169,227,141,131,
       3,169,0,141,40,208,169,
       12,141,37,208,169,11,14
       1
FQ 180 DATA 38,208,169,127,141
       ,13,220,169,214,141,20,
       3,169,193,141,21,3,169,
       27
RD 190 DATA 141,17,208,169,129
       ,141,26,208,169,250,141
       ,18,208,169,117,141,100
       ,3,169
EX 200 DATA 130,141,120,3,169,
       129,141,26,208,96,165,1
       87,208,26,169,127,141,0
       ,220
BA 210 DATA 169,0,141,1,220,17
       3,1,220,201,239,240,1,9
       6,165,189,208,14,230,18
       7
DE 220 DATA 230,189,238,101,3,
       173,101,3,201,145,240,1
       ,96,169,0,133,187,96,17
       3
AP 230 DATA 165,3,240,24,169,0
       ,133,162,32,189,193,41,
       63,9,64,197,162,208,252
DX 240 DATA 32,189,193,41,3,17
       0,76,147,193,169,255,14
       1,0,220,169,0,141,1,220
PX 250 DATA 169,254,141,0,220,
       173,1,220,201,248,176,2
       34,73,255,74,74,74,162,
       255
FF 260 DATA 232,74,144,252,134
       ,2,189,206,193,133,5,18
       9,210,193,133,6,189,202
       ,193
HM 270 DATA 133,253,169,0,133,
       254,169,20,133,248,169,
       224,141,130,3,169,0,133
       ,251
CQ 280 DATA 133,252,169,3,141,
       21,208,96,173,166,3,10,
       10,56,109,166,3,141,166
GG 290 DATA 3,96,200,250,180,2
       00,5,0,0,248,0,0,0,255,
       169,1,141,25,208
HS 300 DATA 169,0,133,3,160,7,
       162,14,185,100,3,157,0,
       208,185,120,3,157,1
CQ 310 DATA 208,185,110,3,10,1
       02,3,185,130,3,153,248,
       7,202,202,136,16,227,16
       5
RH 320 DATA 3,141,16,208,169,2
       50,141,18,208,230,162,7
       6,188,254,198,247,240,1
       ,96
PP 330 DATA 169,90,133,247,32,
       39,193,165,253,24,109,1
       40,3,141,140,3,173,120,
       3
AH 340 DATA 101,254,141,120,3,
       174,167,3,208,26,201,66
       ,208,22,169,0,133,254,1
       69
HF 350 DATA 50,133,253,165,252
       ,48,6,169,60,133,251,20
       8,4,169,190,133,251,173
       ,150
FD 360 DATA 3,24,101,251,141,1
       50,3,173,100,3,101,252,
       141,100,3,201,16,240,4
KX 370 DATA 201,217,208,17,165
       ,251,73,255,24,105,1,13
       3,251,165,252,73,255,10
       5,0
BX 380 DATA 133,252,198,248,20
       8,60,169,20,133,248,165
       ,251,24,101,5,133,251,1
       65,252
AR 390 DATA 101,6,133,252,165,
       254,16,21,173,130,3,201
       ,224,240,6,206,130,3,76
HB 400 DATA 181,194,169,226,14
       1,130,3,76,181,194,173,
       130,3,201,226,240,6,238
       ,130
XC 410 DATA 3,76,181,194,169,2
       24,141,130,3,96,165,188
       ,208,67,173,30,208,41,3
MP 420 DATA 201,3,208,58,169,0
       ,133,5,133,6,230,188,17
       3,100,3,56,237,101,3
CS 430 DATA 24,105,15,16,2,169
       ,0,201,28,144,2,169,27,
       10,170,189,22,195,133
JB 440 DATA 251,189,23,195,133
       ,252,169,128,141,4,212,
       169,129,141,4,212,169,2
       55,133
JC 450 DATA 254,169,120,133,25
       3,96,173,120,3,201,120,
       208,16,173,100,3,201,11
       3,144
BC 460 DATA 9,201,121,176,5,16
       9,1,141,167,3,96,64,255
       ,87,255,100,255,113,255
BE 470 DATA 126,255,139,255,15
       2,255,165,255,188,255,2
       01,255,214,255,227,255,
       240
KJ 480 DATA 255,0,0,0,0,16,0,2
       9,0,42,0,55,0,68,0,91,0
       ,104,0,117,0
HD 490 DATA 130,0,143,0,156,0,
       169,0,192,0,192,0
HK 500 ML$="{I}"+CHR$(8)+"{X}<
       "+CHR$(3)+"{2}XJ"+CHR$(
       16)+CHR$(248)+"L{B}{T}"
       :POKE835,0
XR 510 POKE836,208:POKE830,0:P
       OKE831,216:POKE828,0:PO
       KE829,56:POKE56334,0
RX 520 POKE1,51:ML$=ML$:SYS(PE
       EK(51)+256*PEEK(52)):PO
       KE1,55:POKE56334,1
SD 530 FORI=12568TO12671:READJ
       :POKEI,255-J:NEXT
KD 540 FORI=12672TO12727:READJ
       :POKEI,J:NEXT
HG 550 DATA 0,115,219,219,219,
       219,113,0,0,111,102,102
       ,102,102,198,0
BD 560 DATA 149,149,149,149,16
       5,170,170,170,86,86,86,
       86,90,170,170,170
SB 570 DATA 170,170,170,165,14
       9,149,149,149,170,170,1
       70,90,86,86,86,86
CB 580 DATA 130,130,130,130,13
       0,170,170,170,128,0,0,0
       ,0,0,0,0
CM 590 DATA 255,255,255,126,06
       0,024,0,0,1,0,0,0,0,0,0
       ,0,0,0,0,0,0,0,0,1
HS 600 DATA 0,0,0,0,0,0,0,128,
       255,255,255,126,60,24,0
       ,0,213,213,245,245,253,
       253
KX 610 DATA 255,255,87,87,95,9
       5,127,127,255,255,125,1
       25,125,125,125,125,125,
       125
KC 620 DATA 126,255,255,255,25
       5,255,255,255,255,255,2
       55,255,255,255,255,126
FA 630 DATA 127,255,255,255,25
       5,255,255,127,254,255,2
       55,255,255,255,255,254
MD 640 Q=14336
SD 650 READB:IFB<0THENFORA=1TO
       ABS(B):POKEQ,0:Q=Q+1:NE
       XT:GOTO650
AD 660 IFB=256THENFF=1:GOTO730
MP 670 POKEQ,B:Q=Q+1:GOTO650
KQ 680 DATA -25,60,0,0,255,0,0
       ,85,0,0,85,0,0,20,-51,2
       0,0,0,255,0,0,255,0,0,8
       5,0,0
HR 690 DATA 20,-51,20,0,0,85,0
       ,0,85,0,0,255,0,0,60,-6
       6,255,0,7,255,224,31,25
       5,248
KA 700 DATA 63,255,252,127,255
       ,254,127,255,254,255,25
       5,255,255,255,255,239,2
       56
FD 710 DATA 129,0,0,0,0,0,0,0,
       0,0,0,0,0,0,0,0,129
```

```
EG 720 DATA 128,0,0,0,0,0,0,0,12
       8,1,0,0,0,0,0,0,0,1
PB 730 POKE53272,23:POKE53270,
       200
RQ 740 CL(1)=10:CL(2)=14:FL=0:
       RM=20:PL=2
PF 750 FORA=54272TO54295:POKEA
       ,0:NEXT:POKEA,15:POKE54
       280,17:POKE54284,18
GB 760 IN=1:SK=0:CK=0:P1$="
       {RVS}HOME":P2$="VISITOR
       ":GOSUB770:GOTO860
SE 770 IFFF=1THENRETURN
HB 780 PRINT"{CLR}{3 DOWN}
       {RED}"SPC(6);:POKE53281
       ,0:POKE53280,0
CM 790 PRINT"{RVS}{V}{C}{OFF}
       {2 SPACES}{RVS}{K}{D}
       {F}{OFF}{F} {D}{RVS}{D}
       {F}{OFF}{F}{2 SPACES}
       {RVS}{V}{C}{OFF}
       {2 SPACES}{RVS}{K}{D}
       {C}{OFF}{2 SPACES}{RVS}
       {K}{D}{I}{OFF}{V}"SPC(1
       1)"{WHT}{RVS}{K}{C}{V}
       {OFF}{K} {RVS}{K}{C}{V}
       {OFF}{V} {RVS}{K}";
DH 800 PRINT"{OFF}{K}
       {3 SPACES}{RVS}{K}{C}
       {V}{OFF}{K} {RVS}{K}
       {OFF}{K}{RVS}{K}{OFF}
       {K} {RVS}{K}{C}{OFF}{F}
       "SPC(12)"{BLU}{RVS}{K}
       {OFF}{K}{RVS}{K}{OFF}
       {K} {RVS}{K}{D}{C}{OFF}
       {2 SPACES}{RVS}{K}{OFF}
       {K}{D}{F} {RVS}{K}{OFF}
       {K}{RVS}{K}{OFF}{K}";
JM 810 PRINT" {RVS}{K}{OFF}{K}
       {RVS}{V}{OFF}{V} {RVS}
       {K}{OFF}{K}"SPC(13)"{C}
       {V}{C}{V} {C}{V}{C}{V}
       {2 SPACES}{RVS}{2 I}
       {OFF}{2 SPACES}{C}{V}
       {C}{V} {C}{RVS}{I}{OFF}
       {V}{2 SPACES}{C}{RVS}
       {2 I}{OFF}{V}{2 DOWN}"S
       PC(9);
MR 820 PRINT"{RED} {RVS}{K}{D}
       {F}{OFF}{F} {RVS}{V}{C}
       {OFF} {D}{RVS}{D}{F}
       {OFF}{F}{RVS}{K}{D}{I}
       {OFF}{V}{RVS}{K}{D}{F}
       {OFF}{F} {RVS}{V}{C}
       {OFF} {RVS}{K}{OFF}{K}
       {2 SPACES}{RVS}{K}{OFF}
       {K}"SPC(10)"{WHT}{RVS}
       {K}{C}{V}{OFF}{V}{RVS}
       {K}";
JM 830 PRINT"{C}{V}{OFF}{K}{C}
       {RVS}{C}{OFF}{I} {RVS}
       {K}{C}{OFF}{F} {RVS}{K}
       {C}{V}{OFF}{V}{RVS}{K}
       {C}{V}{OFF}{K}{RVS}{K}
       {OFF}{K}{2 SPACES}{RVS}
       {K}{OFF}{K}"SPC(10)"
       {BLU}{RVS}{K}{OFF}{K}
       {RVS}{K}{OFF}{K}{RVS}
       {K}{OFF}{K}{RVS}{K}
       {OFF}{K}{D}{F}";
FP 840 PRINT"{RVS}{K}{OFF}{K}
       {RVS}{K}{OFF}{K}
       {2 SPACES}{RVS}{K}{OFF}
       {K}{RVS}{K}{OFF}{K}
       {RVS}{K}{OFF}{K}{RVS}
       {K}{OFF}{K}{RVS}{K}
       {OFF}{K}{2 SPACES}{RVS}
       {K}{OFF}{K}"SPC(10)"{C}
       {RVS}{2 I}{OFF} {C}{V}
       {C}{V} {RVS}{2 I}{OFF}
       {SPACE}{C}{RVS}{2 I}";
JK 850 PRINT"{OFF}{V}{C}{RVS}
       {2 I}{OFF} {C}{V}{C}{V}
       {C}{RVS}{2 I}{OFF}{V}
       {C}{RVS}{2 I}{OFF}{V}":
       RETURN
AH 860 PRINTCHR$(14)"{4 DOWN}"
       SPC(12)"{4}PRACTICE
       {4 SPACES}F1":PRINTSPC(
       12)"{2 DOWN}PLAY
       {8 SPACES}F7"
RC 870 POKE198,0:WAIT198,1:GET
       MT$:IFMT$<>"{F1}"ANDMT$
       <>"{F7}"THEN870
CA 880 IFMT$="{F1}"THENFL=1:IN
       $="1":GOTO920
BF 890 C$="{14 SPACES}":PRINTC
       HR$(142)"{4 UP}"SPC(12)
       C$:PRINT"{2 DOWN}"SPC(1
       2)C$"{4 UP}"
SD 900 PRINTSPC(13)"{2 DOWN}
       {RVS}1{OFF} OR {RVS}2
       {OFF} PLAYERS"
EE 910 POKE198,0:WAIT198,1:GET
       IN$:IFIN$=""ORIN$<"1"OR
       IN$>"2"THEN910
FH 920 NP=VAL(IN$):POKE933,-(N
       P=1):PRINT"{CLR}";:POKE
       53280,2:POKE53281,1:TE=
       6:B$=""
QS 930 POKE53272,28:POKE53282,
       3:POKE53283,0:POKE53270
       ,PEEK(53270)OR16
AR 940 W=1063:POKEW,160:A$="
       {RVS} {OFF}"
EJ 950 POKEW+54272,6:C$="{RVS}
       {CYN}{26 SPACES}{RED} "
       :D$="{RVS}{12 SPACES}"
FK 960 FORU=1TO2:FORI=1TO12:PR
       INTC$;:POKE646,TE:PRINT
       D$:SM=W+40*I:POKESM,160
MS 970 POKESM+54272,TE:NEXTI:T
       E=5:W=1543:NEXTU:PRINTC
       $"{GRN}"D$"{HOME}"
CR 980 PRINT"{11 DOWN}"SPC(27)
       "{RED}{RVS}{12 SPACES}
       {HOME}{DOWN}{WHT}":POKE
       1543,160:POKE55815,2
RP 990 PRINT"{RVS}{RED}1B
       {OFF}#${RVS} 2B {OFF}#$
       {RVS} 3B {OFF}#${RVS} 2
       B {OFF}#${RVS} 1B"
QC 1000 PRINT"{3}'({RIGHT}'(
       {RIGHT}'({RIGHT}'(
       {RIGHT}'({RIGHT}'(
       {RIGHT}'({RIGHT}'(
       {RIGHT}'(":PRINT"&&
       {RIGHT}&&{RIGHT}&&
       {RIGHT}&&{RIGHT}&&
       {RIGHT}&&{RIGHT}&&
       {RIGHT}&&{RIGHT}&&"
PB 1010 PRINT"{HOME}{8 DOWN}
       {RED}"SPC(12)"{RVS}
       {2 SPACES}{DOWN}
       {2 LEFT}{RVS}
       {2 SPACES}{DOWN}
       {2 LEFT}{2 SPACES}":PR
       INT"{2 DOWN}{6}
       {4 DOWN}{3}0"SPC(24)"1
       ":Y=24
QQ 1020 X=1:FORI=1TO6:FORZ=1TO
       X:B$=B$+A$:NEXTZ:PRINT
       B$"0";:PRINTTAB(Y)"1"B
       $:B$=""
BP 1030 Y=Y-1:X=X+1:NEXTI:PRIN
       T"{RVS}{7 SPACES}{OFF}
       0"SPC(10)"1{RVS}
       {7 SPACES}{HOME}
       {14 DOWN}{WHT}";
HF 1040 IFFL=1THENPRINT"{HOME}
       {2 DOWN}"SPC(29)"{RVS}
       {BLU}P{DOWN}R{DOWN}A
       {DOWN}C{DOWN}T{DOWN}I
       {DOWN}C{DOWN}E":GOTO11
       00
EM 1050 PRINTSPC(32)"{OFF}
       {GRN}- .":PRINTSPC(31)
       "-{RVS}N{OFF}3{RVS}M
       {OFF}.":PRINTSPC(30)"-
       {RVS}N{OFF}*{RVS}
       {OFF},{RVS}M{OFF}."
SE 1060 PRINTSPC(29)"-{RVS}N
       {OFF}*{RVS}{3 SPACES}
       {OFF},{RVS}M{OFF}.":PR
       INTSPC(28)"-{RVS}N
       {OFF}*{RVS}{5 SPACES}
       {OFF},{RVS}M{OFF}."
PM 1070 PRINTSPC(28)"{WHT}
       {GRN}5"SPC(3)"{RVS}C"S
       PC(3)"{OFF}6{WHT}
       {LEFT}{GRN}":PRINTSPC(
       28)",{RVS}M{OFF}.{RVS}
       {5 SPACES}{OFF}-{RVS}N
       {OFF}*"
EM 1080 PRINTSPC(29)",{RVS}M
       {OFF}.{RVS}{3 SPACES}
       {OFF}-{RVS}N{OFF}*":PR
       INTSPC(30)",{RVS}M
       {OFF}.{RVS} {OFF}-
       {RVS}N{OFF}*"
SK 1090 PRINTSPC(31)",{RVS}M
       {OFF}4{RVS}N{OFF}*":PR
       INTSPC(32)",{GRN}+*
       {HOME}{BLU}"
PR 1100 GOSUB1600:IFFL=1THEN12
       20
JM 1110 IFTEMP=1THENTEMP=0:GOT
       O1210
SQ 1120 IFOUT<3THEN1210
AC 1130 IFNP=1THEN1660
CE 1140 IFIN>=3ANDCK=1ANDS(1)<
       >S(2)THEN1660
CB 1150 OUT=0:TEMP=1:POKEFB,32
       :POKESB,32:POKETB,32
AM 1160 PRINT"{HOME}{14 DOWN}
       {RVS}{CYN}{6 SPACES}CH
       ANGE BATTERS":FORI=1TO
       1000:NEXT
JR 1170 PRINT"{UP}"SPC(6)"
       {RVS}{14 SPACES}":IFNP
       =1THENCK=0:IN=IN+1:PL=
       1:GOTO1190
AJ 1180 CK=CK+1:IFCK=2THENCK=0
       :IN=IN+1
KH 1190 IFPL=1THENPL=2:P1$="
       {RVS}HOME":P2$="VISITO
       R":GOTO1100
AH 1200 PL=1:P1$="HOME":P2$="
       {RVS}VISITOR":GOTO1100
HH 1210 IFPEEK(53250)>90THENFO
       RA=PEEK(53250)TO90STEP
       -1:POKE53250,A:NEXT
RS 1220 SYS49152:IFPEEK(930)TH
       ENPOKE54283,16:POKE542
       83,17
ES 1230 IFFL=1THENRM=RM-1:PRIN
       T"{HOME}{18 DOWN}{GRN}
       "SPC(28)"{RVS}PITCHES"
       RM"{LEFT}{RVS} "
RG 1240 IFFL=1ANDRM=0THEN1690
QJ 1250 IFFL=1THEN1210
JM 1260 PRINT"{HOME}":KT=54272
HC 1270 MT=PEEK(930):IFMT>4THE
       NOUT=OUT+1:SK=0:GOTO11
       00
QQ 1280 IFMT=4THENGOSUB1580
AR 1290 IFMT=0THENSK=SK+1:IFSK
       =3THENOUT=OUT+1:SK=0:G
       OTO1100
CC 1300 IFMT=0THEN1100
DP 1310 TM=MT:SK=0
AA 1320 TE=160:ET=160:G0=CL(PL
       )
RF 1330 A=2017:FB=1822:SB=1617
       :TB=1812:P1=PEEK(FB):P
```

```
        2=PEEK(SB):P3=PEEK(TB)
KC 1340 GOSUB1510:GOSUB1530:B1
        =205:B2=206:B3=205:M0=
        A-39:M1=FB-41:M2=SB+39
HG 1350 M3=TB+41:G1=5:G2=5:G3=
        5
GJ 1360 IFP1=160THENB1=160:G1=
        CL(PL)
GQ 1370 IFP2=160THENB2=160:G2=
        CL(PL)
GA 1380 IFP3=160THENB3=160:G3=
        CL(PL)
AP 1390 X=CL(PL):FORI=1TO4:GOS
        UB1530:GOSUB1570
RS 1400 IFMT=4THENGOSUB1640
CM 1410 POKEM0,TE:POKEM0+KT,G0
        :M0=M0-39:POKEM1,B1:PO
        KEM1+KT,G1
DA 1420 M1=M1-41:POKEM2,B2:POK
        EM2+KT,G2:M2=M2+39:POK
        EM3,B3:POKEM3+KT,G3:M3
        =M3+41
KR 1430 NEXT:GOSUB1530:POKEFB,
        ET:POKEFB+KT,G0
MX 1440 IFB1=160THENPOKESB,160
        :POKESB+54272,G1
GE 1450 IFB2=160THENPOKETB,160
        :POKETB+54272,G2
FG 1460 IFB3=160THENPOKEA,160:
        POKEA+54272,G3
FM 1470 IFMT>1THENTE=206:ET=32
SQ 1480 IFPEEK(A)=160THENS(PL)
        =S(PL)+1:POKEA,43:POKE
        A+KT,5:GOSUB1590:GOSUB
        1600
PA 1490 TM=TM-1:IFTM=0THEN1100
KX 1500 G0=5:GOTO1330
XM 1510 PRINT"{HOME}{14 DOWN}"
        SPC(33)" "
DG 1520 PRINT"{4 DOWN}"SPC(28)
        " "SPC(9)" ":PRINT"
        {4 DOWN}"SPC(33)"{GRN}
        +{HOME}":RETURN
EQ 1530 PRINT"{HOME}{15 DOWN}"
        SPC(32);
QC 1540 PRINT"{RVS}{GRN}N{OFF}
        3{RVS}M{DOWN}{4 LEFT}N
        {OFF}*{RVS} {OFF},
        {RVS}M{DOWN}{6 LEFT}N
        {OFF}*{RVS}{3 SPACES}
        {OFF},{RVS}M{DOWN}
        {8 LEFT}N{OFF}*{RVS}
        {5 SPACES}{OFF},{RVS}M
        "
BB 1550 PRINT"{DOWN}"SPC(29)"
        {RVS}M{OFF}.{RVS}
        {5 SPACES}{OFF}-{RVS}N
        {DOWN}{8 LEFT}M{OFF}.
        {RVS}{3 SPACES}{OFF}-
        {RVS}N"
XS 1560 PRINTSPC(31)"{RVS}M
        {OFF}.{RVS} {OFF}-
        {RVS}N{DOWN}{4 LEFT}M
        {OFF}4{RVS}N{HOME}":RE
        TURN
DC 1570 POKE54273,40:POKE54277
        ,1:POKE54296,15:POKE54
        276,128:POKE54276,129:
        RETURN
DM 1580 POKE54287,40:POKE54291
        ,220:POKE54290,128:POK
        E54290,129:RETURN
AH 1590 POKE54273,70:POKE54277
        ,41:POKE54296,15:POKE5
        4276,16:POKE54276,17:R
        ETURN
GA 1600 IFFL=1THENPRINT"{HOME}
        {18 DOWN}{GRN}"SPC(28)
        "{RVS}PITCHES"RM:RETUR
        N
DM 1610 PRINT"{HOME}{DOWN}
        {BLU}"SPC(28)P2$"{RVS}
        "S(2):PRINTSPC(28)"
        {DOWN}"P1$"{RVS}
        {3 SPACES}"S(1)
BE 1620 PRINTSPC(28)"{2 DOWN}
        {RVS}INNING "IN:PRINTS
        PC(28)"{DOWN}{RVS}STRI
        KE "SK
XQ 1630 PRINTSPC(28)"{DOWN}
        {RVS}OUT{4 SPACES}"OUT
        :RETURN
FF 1640 POKE53281,X:IFX=1THENX
        =CL(PL):RETURN
BH 1650 X=1:RETURN
AX 1660 PRINT"{HOME}"SPC(5)"
        {RVS}{CYN}G A M E
        {2 SPACES}O V E R
        {13 DOWN}"
KG 1670 PRINT"{RVS}{3 SPACES}A
        NY KEY TO PLAY AGAIN":
        POKE198,0:WAIT198,1:GE
        TMT$:CLR
AC 1680 POKE53280,0:POKE53281,
        0:PRINT"{CLR}":GOTO730
SF 1690 PRINT"{HOME}{RVS}{CYN}
          P R A C T I C E
        {2 SPACES}O V E R
        {13 DOWN}":GOTO1670
```

Coder-Decoder

To use with the 128, Plus/4, or 16, see modifications in article.

Article on page 75.

```
MH 63000 REM **** CODER ****
DC 63010 X=10000
FA 63020 Y=631:Z=198:B$=""
XK 63030 PRINT"{WHT}{CLR}"
DP 63040 S$=".ABCDEFGHIJKLMNOP
         QRSTUVWXYZ?!123456789
         0' "
EG 63050 S1$=" !?ZYXWVUTSRQPON
         MLKJIHGFEDCBA.0987654
         321'"
HX 63060 PRINT"ENTER DATA TO B
         E CODED ('END' TO QUI
         T):":INPUTA$:IFA$="EN
         D"THEN END
HC 63070 FORN=1TOLEN(A$)
SR 63080 FORR=1TO41
AM 63090 IFMID$(A$,N,1)=MID$(S
         $,R,1)THENC$=MID$(S1$
         ,R,1):R=41
XX 63100 NEXTR
KR 63110 B$=B$+C$:NEXTN
RB 63120 PRINT"{CLR}{BLK}"X"DA
         "CHR$(34)B$CHR$(34)"
         {2 DOWN}X="X+1":GOTO6
         3020"
SX 63130 POKEY,19:POKEY+1,13:P
         OKEY+2,13:POKEY+3,13:
         POKEZ,4:END
AP 63200 REM **** DECODER ****
BM 63210 S1$=".ABCDEFGHIJKLMNO
         PQRSTUVWXYZ?!12345678
         90' "
BD 63220 S$=" !?ZYXWVUTSRQPONM
         LKJIHGFEDCBA.09876543
         21'"
BK 63230 PRINT"{CLR}ENTER # OF
          DATA STATEMENTS TO D
         ECODE:":INPUTN:FORL=1
         TON:B$=""
RF 63240 READA$:REM GET FROM D
         ATA STATEMENT
KS 63250 FORN=1TOLEN(A$)
KG 63260 FORR=1TO41
BB 63270 IFMID$(A$,N,1)=MID$(S
         $,R,1)THENC$=MID$(S1$
         ,R,1):R=41
HR 63280 NEXTR
FX 63290 B$=B$+C$:NEXTN
KP 63300 PRINTB$:NEXTL:REM USE
          B$ IN YOUR PROGRAM,
         {SPACE}DELETE PRINTB$
          IF NECESSARY
```

Double Load

Article on page 77.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Preview-80 and *SpeedScript*

```
CC 10 IFA=0THENA=1:LOAD"PREVIE
      W-80",8,1
QE 20 PRINT"{CLR}{2 DOWN}LOAD"
      CHR$(34)"SPEEDSCRIPT"CHR
      $(34)",8":PRINT"{4 DOWN}
      SYS52000{HOME}";
BE 30 POKE631,13:POKE632,13:PO
      KE198,2
```

Program 2: Screen-80 and Plus/Term

```
EJ 10 FORI=631TO640:READJ:POKE
      I,J:NEXT:POKE198,10
BS 20 PRINT"{CLR}{2 DOWN}LOAD"
      CHR$(34)"SCREEN-80"CHR$(
      34)",8"
HE 30 PRINT"{4 DOWN}POKE639,13
      1:POKE198,9:RUN{HOME}";
HR 40 DATA 13,13,76,207,34,80,
      34,44,56,58
```

Klondike

Article on page 51.

Program 1: Klondike—64 Version

```
EE 10 PRINT"{CLR}":POKE53280,5
      :POKE53281,5:IFPEEK(1485
      0)<>24THENGOSUB2000
RP 20 DN$="{20 DOWN}":OV$="
      {29 RIGHT}"
PJ 30 BK$="{WHT}SQRT{DOWN}
      {4 LEFT}U{F3}{C3}V":BL$="
      {4 SPACES}{DOWN}{4 LEFT}
      {4 SPACES}":POKE53272,31
SF 40 B2$="{29 SPACES}"
EJ 50 DIM CD$(52):C$(0)="{RED}
      ":C$(1)="{BLK}":C$(2)="
      {RED}":C$(3)="{BLK}":CD$
      (0)=BL$
HH 60 FORX=0TO3:FORY=1TO13
PM 70 CD$(X*13+Y)=C$(X)+"S"+CH
      R$(95+Y)+CHR$(109+X)+"T
      {DOWN}{4 LEFT}U"
GR 75 CD$(X*13+Y)=CD$(X*13+Y)+
      CHR$(173+X)+CHR$(159+Y)+
      "V"
```

```
AH 80 NEXTY,X
JP 90 DIMDK(52),ST(24),LY(7,20
      ),UC(7),TP(7):FORX=1TO52
      :DK(X)=X:NEXT
GC 100 DEFFNR(Z)=INT(52*RND(Z)
      )+1
KS 110 DEFFNSU(X)=INT(X/13.1)+
      1:DEFFNVL(X)=X-13*(FNSU
      (X)-1)
ME 120 DEFFNSC(X)=(X/2=INT(X/2
      )):GOSUB1190
GF 125 IFTT<=0THENTT=500
AF 130 BT=INT((TT+51)/52)
HB 140 GOSUB710:GOSUB720
CC 150 PRINT"{WHT}{CLR} #1
      {2 SPACES}#2{2 SPACES}#
      3{2 SPACES}#4{2 SPACES}
      #5{2 SPACES}#6
      {2 SPACES}#7{5 RIGHT}
      {BLK}P{WHT}ILE{17 DOWN}
      "
KJ 160 PRINTOV$"{BLK}F2{WHT}-E
      ND GAME":PRINTOV$"{BLK}
      F8{WHT}-QUIT{DOWN}"
QB 170 PRINT"{BLK}D{WHT}ECK
      {2 SPACES}{BLK}S{WHT}TA
      CK{3 SPACES}TOTAL":PRIN
      T"{16 RIGHT}BET"
DF 180 PRINT"FROM{7 SPACES}TO"
      ;
KJ 190 PRINT"{HOME}{2 RIGHT}
      {3 DOWN}"OV$"{RED}HEART
      S{4 DOWN}{6 LEFT}{BLK}S
      PADES{4 DOWN}{6 LEFT}
      {RED}DIAMONDS{4 DOWN}
      {8 LEFT}{BLK}";
HE 200 PRINT"CLUBS":NB=-1:GOSU
      B940:NB=0
GK 210 FORX=1TO7:PRINT"{HOME}"
      LEFT$(DN$,X)LEFT$(OV$,X
      *4-4);:FORY=XTO7:IFY=XT
      HEN230
CR 220 PRINTBK$"{UP}";:GOTO240
KR 230 PRINTCD$(LY(X,X))"{UP}"
      ;
BD 240 NEXTY:NEXTX
XS 250 PRINT"{HOME}"OV$"{DOWN}
      ";:FORX=1TO4:PRINTBK$"
      {3 DOWN}{4 LEFT}";:NEXT
      :PRINT
EC 260 GOSUB740
BP 270 GOSUB760:IFQUTHEN1240
XK 280 PRINT"{5 UP}":FORX=1TO5
      :PRINTB2$:NEXT:TT=TT-52
      *BG:GOSUB940
HQ 290 REM *** MAIN LOOP
PJ 300 GW=0:GM=-1:M1=1
CK 310 ED=0:GOSUB960:IFEDTHENP
      RINT"{CLR}":GOTO125
MQ 320 IFQUTHEN1240
XR 330 IFGWTHEN1160
JF 340 GM=0:GOSUB350:GOTO310
KC 350 IFM1>-1THEN380
QD 360 IFDP=0THENRETURN
CE 370 SP=SP+1:ST(SP)=DK(DP):D
      P=DP-1:PRINT"{HOME}"DN$
      "{2 UP}";:GOSUB740:GM=-
      1:RETURN
FS 380 IFM1=0THENC1=ST(SP):C3=
      C1:GOTO400
QH 390 C1=LY(M1,UC(M1)+1):C3=L
      Y(M1,TP(M1))
KQ 400 IFM2>-1THEN600
FG 410 IFC3=0THENRETURN
JQ 420 S3=FNSU(C3):V3=FNVL(C3)
      :IFV3-1<>PL(S3)THENRETU
      RN
HH 430 IFNOTAMTHEN510
AJ 440 BM=0:FORX=1TO4:IFFNSC(X
      )=FNSC(S3)THEN460
FJ 450 IFV3>PL(X)+2THENBM=-1
SM 460 NEXT:IF(M1>0)OR(V3<3)TH
      EN500
HJ 470 FORX=1TO7:C4=LY(X,UC(X)
      +1):V4=FNVL(C4):IFV4<>V
      3-1THEN490
QR 480 IFFNSC(S3)<>FNSC(FNSU(C
      4))THENBM=-1
HA 490 NEXT
XK 500 IFBMTHENRETURN
GD 510 IFM1=0THEN570
BX 520 C=M1:GOSUB1150:IFTP(M1)
      =1THENPRINTBL$:TP(M1)=0
      :GOTO580
RC 530 IFTP(M1)=1THENPRINTBL$:
      TP(M1)=0:GOTO560
EK 540 TP(M1)=TP(M1)-1:PRINTBL
      $"{4 LEFT}{2 UP}"CD$(LY
      (M1,TP(M1)));
BB 550 IFTP(M1)=UC(M1)THENUC(M
      1)=UC(M1)-1
GM 560 GOTO580
RP 570 GOSUB1170
HJ 580 PRINT"{HOME}"OV$LEFT$(D
      N$,S3*4-3)CD$(C3):PL(S3
      )=V3:TT=TT+5*BG:MU=-1
RR 590 GOSUB940:TQ=0:FORQ=1TO4
      :TQ=TQ+PL(Q):NEXT:GW=(T
      Q=52):GM=-1:RETURN
JP 600 C2=LY(M2,TP(M2)):S1=FNS
      C(FNSU(C1)):S2=FNSC(FNS
      U(C2))
XS 610 V1=FNVL(C1):V2=FNVL(C2)
      :IF(V1=13)AND(V2=0)THEN
      630
MX 620 IF(S1=S2)OR(V1+1<>V2)TH
      ENRETURN
KM 630 IFM1>0THEN650
CP 640 GOSUB1170:LY(M2,TP(M2)+
      1)=C1:NC=1:GOTO690
MF 650 NC=TP(M1)-UC(M1):C=M1:P
      RINT"{HOME}"LEFT$(DN$,U
      C(C)+1)LEFT$(OV$,C*4-4)
      ;
QA 660 FORX=1TONC:PRINTBL$"
      {4 LEFT}";:LY(M2,TP(M2)
      +X)=LY(M1,UC(M1)+X):NEX
      T
RA 670 TP(M1)=UC(M1):UC(M1)=UC
      (M1)-1-(UC(M1)=0)
RF 680 IFTP(M1)>0THENGOSUB1150
      :PRINTCD$(LY(M1,TP(M1))
      );
CX 690 C=M2:GOSUB1150:PRINT"
      {DOWN}";:FORX=1TONC:PRI
      NTCD$(LY(M2,TP(M2)+X))"
      {4 LEFT}";:NEXT
AQ 700 TP(M2)=TP(M2)+NC:GM=-1:
      RETURN
FM 710 FORX=1TO52:A=FNR(0):S=D
      K(A):DK(A)=DK(X):DK(X)=
      S:NEXT:DP=52:RETURN
XH 720 FORX=1TO7:FORY=XTO7:LY(
      Y,X)=DK(DP):DP=DP-1:NEX
      TY:TP(X)=X:UC(X)=X-1:NE
      XTX
PA 730 ST(1)=DK(DP):DP=DP-1:SP
      =1:FORX=1TO4:PL(X)=0:NE
      XT:RETURN
BP 740 PRINT"{HOME}"DN$"{UP}"B
      K$"{UP}{2 RIGHT}"CD$(ST
      (SP))
DP 750 PRINT"{WHT}"DP"{LEFT} "
      ;TAB(6)SP"{LEFT} ";:RET
      URN
SS 760 PRINT"{WHT}{HOME}
      {10 DOWN} PLEASE ENTER
      {SPACE}YOUR BET"
SM 770 PRINT" MAXIMUM BET =
      {BLK}"BT
AG 780 PRINT"{WHT} PRESS {BLK}
      F1{WHT} TO BET IT ALL"
AF 790 PRINT" PRESS {BLK}F7
      {WHT} TO RE-SHUFFLE"
FF 800 PRINT" ->{8 SPACES}
      {7 LEFT}{BLK}[O]{LEFT}"
      ;:N=0:BG=0:B$=""
KK 810 GETA$:IFA$=""THEN810
SD 820 IF(A$=CHR$(133))AND(N=0
      )THENBG=BT:RETURN
RM 830 IF(A$=CHR$(136))AND(N=0
      )THEN910
MG 840 IF(A$=CHR$(140))AND(N=0
      )THENQU=-1:RETURN
PB 850 IFA$<>CHR$(13)THEN880
KM 860 BG=VAL(B$):IFNOT((BG=0)
      OR(BG>BT))THENRETURN
BM 870 PRINT:PRINT"{UP}
      {4 RIGHT}{12 SPACES}":G
      OTO760
QF 880 IF(A$<":")AND(A$>"/")AN
      D(N<11)THENB$=B$+A$:N=N
      +1:PRINTA$"[O]{LEFT}";:
      GOTO810
KG 890 IF(A$=CHR$(20))AND(N>0)
      THENN=N-1:PRINT"
      {2 LEFT}[O]{LEFT}";:B$=
      MID$(B$,1,N)
SR 900 GOTO810
BB 910 PRINT"WORKING":GOSUB710
      :GOSUB720
HR 920 PRINT"{HOME}{DOWN}";:FO
      RX=1TO7:PRINTCD$(LY(X,X
      ));:NEXT
PP 930 PRINT:PRINT"{10 DOWN}
      {6 RIGHT}"CD$(ST(SP)):G
      OTO760
RD 940 PRINT"{HOME}{BLK}
      {2 DOWN}"DN$TAB(19)TT"
      {LEFT} ":IFNBTHENRETURN
DS 950 PRINTTAB(19)BG:RETURN
JX 960 IFNOTGMTHEN1010
SC 970 AM=-1:M2=-1:IFM1>0THENM
      U=0:FORZ=1TO7:M1=Z:GOSU
      B350:NEXT
AA 980 M1=0:GOSUB350
KA 990 IFMUTHENM1=1:GOTO970
AC 1000 AM=0:IFGWTHENRETURN
AS 1010 PRINT"{HOME}{BLK}"DN$"
      {4 DOWN}{5 RIGHT}
      {5 SPACES}{4 RIGHT}
      {5 SPACES}{14 LEFT}";
JB 1020 GETA$:IFA$=""THEN1020
SM 1030 IF(A$>"0")AND(A$<"8")T
      HENM1=VAL(A$):PRINTA$"
      {8 RIGHT}";:GOTO1090
MM 1040 IFA$=CHR$(137)THENED=-
      1:RETURN
HA 1050 IFA$="D"THENM1=-1:PRIN
      T"DECK";:RETURN
PQ 1060 IFA$="S"THENM1=0:PRINT
      "STACK{4 RIGHT}";:GOTO
      1090
AA 1070 IFA$=CHR$(140)THENQU=-
      1:RETURN
HC 1080 GOTO1020
GB 1090 GETA$:IFA$=""THEN1090
SK 1100 IF(A$>"0")AND(A$<"8")T
      HENM2=VAL(A$):PRINTA$;
      :RETURN
HB 1110 IF(A$="P")OR(A$="F")TH
      ENM2=-1:PRINT"PILE";:R
      ETURN
JC 1120 GOTO1010
HJ 1150 PRINT"{HOME}"LEFT$(DN$
      ,TP(C))LEFT$(OV$,C*4-4
      );:RETURN
QP 1160 TT=TT+740*BG:PRINT"
      {CLR}{3 DOWN}
      {10 RIGHT}YOU WON!":GO
      TO130
GQ 1170 SP=SP-1:IFSP=0ANDDP>0T
      HENSP=1:ST(SP)=DK(DP):
      DP=DP-1
JK 1180 GOSUB740:RETURN
GJ 1190 INPUT"{CLR}{BLK}{DOWN}
      {RIGHT}ENTER YOUR NAME
      ";N$
RR 1200 F$="@0:"+N$+".MONEY,S,
```

```
        ":OPEN2,8,2,F$+"R"
HP 1210 INPUT#2,TT:CLOSE2
HD 1220 OPEN2,8,2,F$+"W"
QD 1230 PRINT#2,0:CLOSE2:RETUR
        N
XK 1240 OPEN2,8,2,F$+"W":PRINT
        #2,TT:CLOSE2
SP 1250 PRINT"{CLR}{BLK}{DOWN}
        {RIGHT}GOODBYE..."
HS 1260 END
HF 2000 FORX=828TO885:READA:PO
        KEX,A:NEXT:SYS828
DE 2010 FORX=0TO16:B=14848+X*8
        :C=15104+X*8:FORY=2TO7
        :READA
QJ 2020 POKEB+Y,A:IFX>12THENA=
        A/2
JX 2030 POKEC+Y-1+(X>12),A:NEX
        TY
AJ 2040 POKEB,255:POKEC+7,255:
        POKEB+1,0:POKEC-6*(X>1
        2),0:NEXTX
QC 2050 FORX=14984TO15031:READ
        A:POKEX,A:NEXT
DE 2060 FORX=15320TO15335:READ
        A:POKEX,A:NEXT
XD 2070 RETURN
KB 2080 DATA169,0,141,14,220,1
        69,51,133,1,169,0,133,
        251,133,253,169
SQ 2090 DATA208,133,252,169,56
        ,133,254,160,0,177,251
        ,145
QM 2100 DATA253,230,251,230,25
        3,208,246,165,252,201,
        215,240,7,230,252,230
FD 2110 DATA254,76,85,3,169,55
        ,133,1,169,129,141,14,
        220,96
JK 2120 DATA 24,60,102,126,102
        ,0
JC 2130 DATA 60,102,12,48,126,
        0
KD 2140 DATA 60,102,12,102,60,
        0
AH 2150 DATA 102,102,126,6,6,0
XP 2160 DATA 126,96,124,6,124,
        0
SD 2170 DATA 60,96,124,102,60,
        0
HS 2180 DATA 126,6,12,24,24,0
JM 2190 DATA 60,102,60,102,60,
        0
DS 2200 DATA 60,102,62,6,60,0
QR 2210 DATA 126,24,24,24,24,0
QX 2220 DATA 30,12,12,108,56,0
JP 2230 DATA 60,102,102,60,14,
        0
JE 2240 DATA 102,108,120,108,1
        02,0
KC 2250 DATA 108,254,254,124,5
        6,16
QJ 2260 DATA 16,56,124,254,56,
        124
MS 2270 DATA 24,60,126,126,60,
        24
JA 2280 DATA 56,56,254,254,56,
        124
GG 2290 DATA 255,51,102,204,15
        3,51,102,204
KH 2300 DATA 255,204,102,51,15
        3,204,102,51
MX 2310 DATA 0,3,3,3,3,3,3,3
XC 2320 DATA 0,192,192,192,192
        ,192,192,192
MJ 2330 DATA 3,3,3,3,3,3,3,0
GG 2340 DATA 192,192,192,192,1
        92,192,192,0
XF 2350 DATA 204,102,51,153,20
        4,102,51,255
JE 2360 DATA 51,102,204,153,51
        ,102,204,255
```

Program 2: Klondike—Plus/4 And 16 Substitution Lines

```
AM 10 COLOR0,16,5:COLOR4,16,5:
      IFPEEK(1485Ø)<>24THENGOS
      UB2000
JX 15 POKE65298,PEEK(65298)AND
      251:POKE65299,PEEK(65299
      )AND3OR56
XA 18 POKE56,55:CLR
AG 20 DN$="{19 DOWN}":OV$="
      {29 RIGHT}"
PX 30 BK$="{WHT}SQRT{DOWN}
      {4 LEFT}U{F}{C}V":BL$="
      {4 SPACES}{DOWN}{4 LEFT}
      {4 SPACES}"
MX 35 KEY1,CHR$(133):KEY2,CHR$
      (137):KEY6,CHR$(140):KEY
      7,CHR$(136)
PF 160 PRINTOV$"{BLK}F2{WHT}-E
      ND GAME":PRINTOV$"{BLK}
      F6{WHT}-QUIT{DOWN}"
AK 930 PRINT:PRINT"{9 DOWN}
      {6 RIGHT}"CD$(ST(SP)):G
      OTO760
FF 2000 FORX=828TO867:READA:PO
        KEX,A:NEXT:SYS828
MR 2080 DATA169,0,133,3,133,5,
        169
AG 2090 DATA208,133,4,169,56,1
        33,6,160,0,177,3,145
PC 2100 DATA5,230,3,230,5,208,
        246,165,4,201,215,240,
        7,230,4,230
XR 2110 DATA6,76,76,3,96
```

Super Synth

Article on page 72.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
RP 100 POKE53281,0:POKE53280,0
       :PRINT"{CLR}":POKE214,1
       0
JR 110 PRINTTAB(9)"{DOWN}{YEL}
       WELCOME TO SUPER-SYNTH"
RM 120 PRINT:PRINTTAB(3)"WHILE
        WAITING FOR FREQUENCIE
       S TO BE
MP 130 PRINT:PRINTTAB(5)"CALCU
       LATED, TURN UP THE VOLU
       ME.":K=256:CH=35
SF 140 M=1.005:MA=64:DIMF1(MA)
       ,F2(MA),F3(MA),F4(MA),G
       1(MA),G2(MA),G3(MA),G4(
       MA)
KK 150 DIMH1(MA),H2(MA),H3(MA)
       ,H4(MA)
QG 160 PRINT:READT,N:N1=N*M:N2
       =N*2:N3=N*2*M:N4=INT(N/
       2):N5=INT(N/2*M)
SB 170 F1(T)=INT(N/K):F2(T)=N-
       (F1(T)*K):F3(T)=INT(N1/
       K):F4(T)=INT(N1-(F3(T)*
       K))
BD 180 G1(T)=INT(N2/K):G2(T)=N
       2-(G1(T)*K):G3(T)=INT(N
       3/K):G4(T)=INT(N3-(G3(T
       )*K))
SB 190 H1(T)=INT(N4/K):H2(T)=N
       4-(H1(T)*K):H3(T)=INT(N
       5/K):H4(T)=INT(N5-(H3(T
       )*K))
EH 200 IFT<>CHTHEN160
RR 210 IFCH<>50THENFORT=1TO10:
       PRINT:NEXT:PRINTTAB(16)
       "THANKS!":CH=50:GOTO160
SC 220 NF=8:NK=64:KB=197:V=542
       72:V1=V+1:V2=V:V3=V+8:V
       4=V+7:RN=RND(-TI)
XM 230 FL=0:DB=8:DC=8:DD=8:VO=
       31:VS=17:VI=90:XT=1:PO=
       240:Z=2:W1=33:W2=33:AT=
       8:DE=8
RS 240 SU=8:RE=8:GOSUB490
RX 250 GOSUB480:FORT=VTOV+23:P
       OKET,0:NEXT:POKEV+5,AD:
       POKEV+6,SR:POKEV+12,AD
CC 260 POKEV+13,SR:POKEV+3,DB:
       POKEV+10,DC:POKEV+17,DD
       :POKEV+14,VI:POKEV+18,V
       S
SB 270 POKEV+23,PO:POKEV+24,VO
RP 280 T=PEEK(KB):IFT=NKTHEN28
       0
SR 290 IFT<NFTHEN470
QF 300 ONZGOTO310,330,340,350,
       360,320
GB 310 POKEV1,G1(T):POKEV2,G2(
       T):POKEV3,G3(T):POKEV4,
       G4(T):GOTO370
RK 320 POKEV1,H1(T):POKEV2,H2(
       T):POKEV3,H3(T):POKEV4,
       H4(T):GOTO370
BX 330 GOSUB460:GOTO370
SQ 340 GOSUB460:POKEV+15,F1(T)
       /.7:GOTO370
MD 350 GOSUB460:POKEV+15,F1(T)
       /2:GOTO370
GK 360 GOSUB460:POKEV+4,W1:POK
       EV+11,W2:FORY=1TO10:NEX
       T:GOTO430
MA 370 POKEV+4,W1:POKEV+11,W2
AD 380 IFZ=4THENFORU=1TOSLSTEP
       XT:POKEV+1,U:IFPEEK(KB)
       =TTHENNEXT
GF 390 IFZ=4THENGOSUB440:GOTO4
       30
KD 400 IFFL=1THENPOKEV,PEEK(V+
       27):POKEV+7,PEEK(V+27):
       GOTO420
MJ 410 IFFL=2THENFORU=1TOSLSTE
       P10:POKEV+22,U:IFPEEK(K
       B)=TTHENNEXT:GOSUB440:G
       OTO430
FD 420 IFPEEK(KB)=TTHEN380
QE 430 POKEV+4,W1-1:POKEV+11,W
       2-1:POKEV+15,0:GOTO280
AB 440 IFPEEK(KB)<>NKTHEN440
FC 450 RETURN
XC 460 POKEV1,F1(T):POKEV2,F2(
       T):POKEV3,F3(T):POKEV4,
       F4(T):RETURN
GC 470 ONT+1GOTO280,1050,280,1
       260,230,690,1200,280
CM 480 AD=AT*16+DE:SR=SU*16+RE
       :RETURN
EF 490 POKE53280,0:POKE53281,0
       :PRINT"{CLR}{YEL}"
GA 500 PRINTTAB(12)"KEYBOARD S
       CREEN{2 DOWN}"
BS 510 PRINTTAB(13)"F1 - NORMA
       L":PRINTTAB(13)"F3 - NE
       W SOUND
KM 520 PRINTTAB(13)"F5 - SAVE
       {SPACE}SOUND
JP 530 PRINTTAB(13)"F7 - LOAD
       {SPACE}SOUND{2 DOWN}
       {WHT}"
HJ 540 PRINTTAB(5)"{M}{RVS}
       {RIGHT} {RIGHT} -
       {RIGHT} {RIGHT} {RIGHT}
```

```
        - {RIGHT} {RIGHT} B
        {RIGHT} {RIGHT} {OFF}C
        {RVS} "
BE 550  PRINTTAB(5)"{M}{RVS}
        {OFF}2{RVS} {OFF}3{RVS}
         - {OFF}5{RVS} {OFF}6
        {RVS} {OFF}7{RVS} -
        {OFF}9{RVS} {OFF}0{RVS}
         - {OFF}-{RVS} {OFF}£
        {RVS} {OFF}H{RVS} "
JA 560  PRINTTAB(5)"{M}{RVS} -
        {SPACE}- - - - - - - -
        {SPACE}- - - - {OFF}
        {YEL}*I{WHT}"
KD 570  PRINTTAB(5)"{M}{RVS}Q-W
        -E-R-T-Y-U-I-O-P-@-*-↑-
        Z{OFF}{2 SPACES}{YEL}B"
GF 580  PRINTTAB(35)"B":PRINTTA
        B(6)"UCCCCCCCCCCCCCCCCC
        CCCCCCCCCCK"
AB 590  PRINTTAB(6)"B":PRINTTAB
        (6)"B {WHT}{N}{RVS} B
        {RIGHT} {RIGHT} -
        {RIGHT} {RIGHT} {RIGHT}
         - {RIGHT} {RIGHT}
        {OFF}{H}"
PS 600  PRINTTAB(6)"{YEL}B{WHT}
        {N}{RVS} B {OFF}D{RVS}
        {OFF}F{RVS} - {OFF}H
        {RVS} {OFF}J{RVS} {OFF}
        K{RVS} - {OFF}:{RVS}
        {OFF};{RVS} {OFF}{H}"
DK 610  PRINTTAB(6)"{YEL}J*
        {WHT}{M}{RVS} B B - - -
         - - - - - {OFF}{H}"
MD 620  PRINTTAB(8)"{N}{RVS}ZBX
        -C-V-B-N-M-,-.-/- {OFF}
        {H}{DOWN}"
GP 630  PRINTTAB(8)"{YEL}RETURN
         FOR VALUES SCREEN":RET
        URN
AS 640  DATA 62,2145,9,2408,14,
        2703,17,2864,22,3215,25
        ,3608,30,4050,33,4291
JJ 650  DATA 38,4817,41,5407,46
        ,5728,49,6430,54,7217,1
        2,8101,23,8583,20,9634
HE 660  DATA 31,10814,28,11457,
        39,12860,36,14435,47,16
        203,44,17167,55,19269
QH 670  DATA 59,2273,8,2551,16,
        3034,19,3406,24,3823,32
        ,4547,35,5103,43,6069,4
        8,6812
XD 680  DATA 51,7647,18,9094,21
        ,10207,29,12139,34,1362
        5,37,15294,45,18188,50,
        20415
BP 690  Z=INT(6*RND(1))+1:FL=IN
        T(3*RND(1))+0
HQ 700  SL=INT(255*RND(1))+1
CS 710  W1=INT(7*RND(1))+1:ONW1
        GOTO720,730,740,750,760
        ,770,780
SG 720  W1=17:GOTO790
AG 730  W1=33:GOTO790
BF 740  W1=65:GOTO790
CH 750  W1=129:GOTO790
FH 760  W1=21:GOTO790
KE 770  W1=23:GOTO790
KD 780  W1=85
GK 790  W2=INT(8*RND(1))+1:ONW2
        GOTO800,810,820,830,840
        ,850,860,870
AX 800  W2=1:GOTO880
DJ 810  W2=17:GOTO880
FJ 820  W2=33:GOTO880
GX 830  W2=65:GOTO880
XK 840  W2=129:GOTO880
MJ 850  W2=21:GOTO880
SS 860  W2=23:GOTO880
PK 870  W2=85
DR 880  AT=INT(10*RND(1))+1:DE=
        INT(15*RND(1))+1:SU=INT
        (15*RND(1))+1
RF 890  RE=INT(15*RND(1))+1:SO=
        INT(4*RND(1))+1:ONSOGOT
        O895,900,910,920
JC 895  PO=240:GOTO930
HQ 900  PO=241:GOTO930
RC 910  PO=242:GOTO930
MQ 920  PO=243
CA 930  XT=INT(40*RND(1))+1
BR 940  VS=INT(4*RND(1))+1:ONVS
        GOTO950,960,970,980
XR 950  VS=17:GOTO990
BR 960  VS=33:GOTO990
DA 970  VS=65:GOTO990
EF 980  VS=129
AE 990  VI=INT(200*RND(1))+55
MH 1000 DB=INT(8*RND(1))+1:DC=
        INT(8*RND(1))+1:DD=INT
        (8*RND(1))+1
AX 1010 VO=INT(3*RND(1))+1:ONV
        OGOTO1020,1030,1040
KF 1020 VO=31:GOTO250
AJ 1030 VO=45:GOTO250
PR 1040 VO=79:GOTO250
BF 1050 POKE53280,6:POKE53281,
        6:POKE198,0:PRINT"
        {CLR}{WHT}":PRINTTAB(1
        3)"VALUES SCREEN
        {2 DOWN}"
MC 1060 PRINT"Z ="TAB(21)Z:PRI
        NT"FL ="TAB(21)FL
ED 1070 PRINT"VOICE 1 ="TAB(21
        )W1:PRINT"VOICE 2 ="TA
        B(21)W2
JX 1080 PRINT"ATTACK ="TAB(21)
        AT:PRINT"DECAY ="TAB(2
        1)DE
HB 1090 PRINT"SUSTAIN ="TAB(21
        )SU:PRINT"RELEASE ="TA
        B(21)RE
DG 1100 PRINT"RESONANCE ="TAB(
        21)PO
HA 1110 PRINT"SYNC SPEED ="TAB
        (21)XT
QB 1120 PRINT"VIBRATO SPEED ="
        TAB(21)VI
EB 1130 PRINT"VIBRATO SHAPE ="
        TAB(21)VS:PRINT"PULSE
        {SPACE}SHAPE VOICE 1 =
        "DB
JE 1140 PRINT"PULSE SHAPE VOIC
        E 2 ="DC:PRINT"PULSE S
        HAPE VOICE 3 ="DD
ME 1150 PRINT"FILTER ="TAB(21)
        VO
HS 1160 PRINT"STEP LIMIT ="TAB
        (21)SL
BC 1170 PRINT"{DOWN}{RVS}PRESS
         RETURN FOR KEYBOARD S
        CREEN
QD 1180 GETA$:IFA$<>CHR$(13)TH
        EN1180
CA 1190 GOSUB490:GOTO280
HP 1200 S$="":POKE198,0:PRINT"
        {CLR}":POKE214,9:PRINT
        :POKE211,4
SJ 1210 INPUT"SOUND TO SAVE";S
        $:IFS$=""THENGOSUB490:
        GOTO280
RD 1220 OPEN1,8,1,S$:PRINT#1,Z
DK 1230 PRINT#1,FL:PRINT#1,W1:
        PRINT#1,W2:PRINT#1,AT:
        PRINT#1,DE:PRINT#1,SU
HF 1240 PRINT#1,RE:PRINT#1,PO:
        PRINT#1,XT:PRINT#1,VI:
        PRINT#1,VS:PRINT#1,DB
EB 1250 PRINT#1,DC:PRINT#1,DD:
        PRINT#1,VO:PRINT#1,SL:
        CLOSE1:GOSUB490:GOTO28
        0
AG 1260 S$="":POKE198,0:PRINT"
        {CLR}":POKE214,9:PRINT
        :POKE211,4
SJ 1270 INPUT"SOUND TO LOAD";S
        $:IFS$=""THENGOSUB490:
        GOTO280
HM 1280 OPEN1,8,0,S$:INPUT#1,Z
GE 1290 INPUT#1,FL:INPUT#1,W1:
        INPUT#1,W2:INPUT#1,AT:
        INPUT#1,DE:INPUT#1,SU
XB 1300 INPUT#1,RE:INPUT#1,PO:
        INPUT#1,XT:INPUT#1,VI:
        INPUT#1,VS:INPUT#1,DB
PX 1310 INPUT#1,DC:INPUT#1,DD:
        INPUT#1,VO:INPUT#1,SL:
        CLOSE1:GOSUB490:GOTO25
        0
```

Word Counter

128 Users: See instructions in article before typing in.

Article on page 74.

```
DD 10   PRINT"{CLR}"CHR$(142):BS
        =828:POKE53280,6:POKE532
        81,6
CP 20   I=I+1:READA:IFA<0THEN50
QQ 30   POKEBS+1+I,A
AC 40   GOTO20
RA 50   Z=0:D$=""
EF 60   PRINT"{CLR}{2 DOWN}PRESS
        D FOR DIRECTORY"
KG 70   GETA$:IFA$=""THEN70
FX 80   IFA$<>"D"THEN160
XG 90   OPEN1,8,0,"$0"
ES 100  PRINT:FORA=1TO32:GET#1,
        C$:NEXT
KR 110  GET#1,B$:IFST<>0THENCLO
        SE1:SYS65484:GOTO160
BC 120  IFB$<>CHR$(34)THEN110
PC 130  GET#1,B$:IFB$<>CHR$(34)
        THEND$=D$+B$:GOTO130
MB 140  GET#1,B$:IFB$=CHR$(32)T
        HEN140
AE 150  PRINT" ";B$;"{3 SPACES}
        ";D$:D$="":GOTO110
HD 160  INPUT"{2 DOWN}FILE NAME
        ";F$
AJ 170  IFF$=""THENPRINT"{4 UP}
        ":GOTO160
FE 180  PRINT"{CLR}{2 DOWN}FILE
         TYPE?"
EM 190  PRINT"{2 DOWN}{RVS}P
        {OFF}ROGRAM"
GM 200  PRINT"{DOWN}{RVS}S{OFF}
        EQUENTIAL"
HR 210  GETG$:IFG$<>"P"ANDG$<>"
        S"THEN210
KX 220  PRINT"{2 DOWN}COUNTING"
BR 230  IFG$="S"THEN250
JK 240  OPEN1,8,0,F$+",P,R":GOT
        O260
MP 250  OPEN1,8,0,F$+",S,R"
FA 260  SYSBS+2
AK 270  Z=PEEK(BS)+256*PEEK(BS+
        1)+2
RC 280  PRINT"{CLR}{DOWN}NUMBER
         OF WORDS:"Z:CLOSE1
DF 290  OPEN15,8,15,"I0":CLOSE1
        5
GP 300  PRINT"{DOWN}ANOTHER FIL
        E?{2 SPACES}(Y/N)
AQ 310  GETA$:IFA$="Y"THEN50
AB 320  IFA$="N"THENEND
CG 330  GOTO310
JR 340  DATA169,0,141,58,3,141,
        59,3,141,60,3,141,61,3,
        162,1,32,198,255,32
KR 350  DATA183,255,41,64,208,3
```

```
        4,32,207,255,141,58,3,2
        01,32,208,15,32,207,255
CQ 360  DATA201,32,240,8,238,60
        ,3,208,3,238,61,3,173,5
        8,3,141,59,3,76,81
CX 370  DATA3,32,231,255,96,-1
```

Read-A-Tune

Article on page 76.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Read-A-Tune—64 Version

```
DM 10   PRINT"{CLR}LOADING ML...
        ":FORI=1TO255:A$=A$+" ":
        NEXT:NS=125:DIMM$(NS),N$
        (NS)
FF 20   FORI=49152TO49290:READA:
        POKEI,A:CK=CK+A:NEXT:REM
         LOAD KEY NOTE PLAYER
GM 30   IFCK<>15135THENPRINT"ERR
        OR IN DATA STATEMENTS.":
        STOP
SR 40   DATA 162,49,160,234,173,
        97,192,73,1,141
JF 50   DATA 97,192,240,4,162,27
        ,160,192,120,142
CD 60   DATA 20,3,140,21,3,88,96
        ,164,197,185
AM 70   DATA 129,235,56,233,65,4
        8,27,201,15,176
GG 80   DATA 23,168,169,64,141,4
        ,212,185,67,192
HE 90   DATA 190,82,192,141,1,21
        2,142,0,212,169
PX 100  DATA 65,141,4,212,76,49
        ,234,28,31,16
DR 110  DATA 18,21,22,25,33,37,
        42,44,50,12
EC 120  DATA 14,15,49,165,195,2
        09,31,96,30,135
SG 130  DATA 162,62,193,60,143,
        24,210,0
HX 140  DATA 32,253,174,32,139,
        176,160,1,177,71
PA 150  DATA 133,2,200,177,71,1
        33,3,162,1,32
FK 160  DATA 198,255,160,0,32,2
        07,255,145,2,201
QJ 170  DATA 46,240,4,200,76,12
        2,192,200,132,4,96
DC 180  FORI=54272TO54296:POKEI
        ,0:NEXT:POKE54275,5:POK
        E54296,12
XC 190  RL=54272:RH=54273:DIMH(
        15),L(15):FORI=1TO15:RE
        ADH(I),L(I):NEXT:REMNOT
        E DATA
MQ 200  DATA 28,49,31,165,16,19
        5,18,209,21,31,22,96
GD 210  DATA 25,30,33,135,37,16
        2,42,62,44,193,50,60,12
        ,143,14,24,15,210
HH 220  POKE53281,15:POKE53280,
        4
PC 230  IFENTHENPRINT"{CLR}":CL
        OSE15:END
JX 240  PRINT"{CLR}{2 DOWN}
        {BLK}{3 SPACES}{RVS} TH
        E 64 READ-A-TUNE MUSIC
        {SPACE}SYSTEM! {OFF}"
DP 250  PRINT,"{2 DOWN}1=WRITE
        {SPACE}A SONG":PRINT,"
        {DOWN}2=PLAY BACK YOUR
        {SPACE}SONG"
GK 260  PRINT,"{DOWN}3=RECALL Y
        OUR SONGS":PRINT,"
        {DOWN}4=SAVE YOUR SONGS
        "
GA 270  PRINT,"{DOWN}5=12TH STR
        EET RAG":PRINT,"{DOWN}6
        =YANKEE DOODLE"
CP 280  PRINT,"{DOWN}7=SOME REA
        LLY FAST SCALES!":PRINT
        ,"{DOWN}8=END OF PROGRA
        M"
KD 290  PRINT,"{2 DOWN}SELECT O
        NE:"
CD 300  D$="HBAHBAHBAHBAHBAAHBA
        HHAHBAAEREEDRHBAHBAHBAH
        BAHBAAHBAHHAHBAAEEFFGG"
DE 310  D$=D$+"HBAHBAHBAHBAHBAA
        HBAHHAHBAAEREEDRFFGAGGA
        BABHIHBAGHHG AAGEECCCRHH
        HR."
FB 320  E$="HRHRIRJRHRJRIRGRHRH
        RIRJRHHHHBBGGHRHRIRJRKR
        JRIRHRBRGRARBRHHHRHHHR"
DB 330  E$=E$+"AAABAAGGAABBHHHR
        GGGAGGFFEEFFGGGRAAABAAG
        GAABBHHAAGGHHBBIIHHHRHH
        HR."
KQ 340  F$="HHHHGRGRAAAAGGGGRRR
        RBBBBHHHHCCCRR."
QJ 350  G$="MNOCDEFGABHIJKLLRRL
        KJIHBAGFEDCONMMRRCDEFGA
        BHBAGFEDCCRRCDEFGABHBAG
        FEDC."
BB 360  GETQ$:IFQ$=""THEN360
ME 370  Q=VAL(Q$):ONQGOTO510,70
        0,860,850,400,410,390,4
        20
PR 380  GOTO360
XB 390  PRINT"{CLR}{BLK}
        {7 SPACES}SOME REALLY F
        AST SCALES!":PRINT"
        {DOWN}"G$:SP=1:GOTO430
KK 400  PRINT"{CLR}{BLK}"," TWE
        LFTH STREET RAG
        {2 SPACES}":PRINT"
        {DOWN}"D$:SP=9:GOTO430
FQ 410  PRINT"{CLR}{BLK}","
        {3 SPACES}YANKEE DOODLE
        ":PRINT"{DOWN}"E$:SP=28
        :GOTO430
PS 420  PRINT"{CLR}{RED}","
        {2 SPACES}THAT'S ALL!
        {BLK}":PRINT"{DOWN}"F$:
        SP=4:EN=1
FA 430  X=0:POKE54277,31:POKE54
        276,64:POKE54278,255
GX 440  X=X+1:P=1094+X:PP=PEEK(
        P)
SQ 450  IFPP=18ORPP=32THENPOKER
        H,0:POKERL,0:GOTO490
XD 460  IFPP=46THENPOKERH,0:POK
        ERL,0:POKE54276,64:GOTO
        230
FP 470  IFPP>15THEN440
PE 480  POKE54276,65:POKERH,H(P
        P):POKERL,L(PP)
BD 490  FORT=1TOSP:NEXT:PP=PP+1
        28:POKEP,PP:FORT=1TOSP:
        NEXT
BM 500  PP=PP-128:POKEP,PP:GOTO
        440
BM 510  N=N+1:IFN>NSTHENPRINT"
        {CLR}{2 DOWN}TOO MANY T
        UNES!":FORDE=1TO1000:NE
        XT:N=N-1:GOTO240
KM 520  POKE54277,25:POKE54278,
        0
JM 530  PRINT"{CLR}{DOWN}{BLU}S
        O YOU'RE READY TO WRITE
         A SONG!"
PC 540  PRINT"{2 DOWN}{BLK}HERE
         ARE THE NOTES:":PRINT"
        {DOWN}M=LOW G{3 SPACES}
        N=LOW A{4 SPACES}O=LOW
        {SPACE}B"
PE 550  PRINT"C=MID C{3 SPACES}
        D=MID D{4 SPACES}E=MID
        {SPACE}E{3 SPACES}F=MID
         F"
HP 560  PRINT"G=MID G{3 SPACES}
        A=MID A{4 SPACES}B=MID
        {SPACE}B{3 SPACES}H=HIG
        H C"
HF 570  PRINT"I=HIGH D
        {2 SPACES}J=HIGH E
        {3 SPACES}K=HIGH F
        {2 SPACES}L=HIGH G":PRI
        NT"R=REST{DOWN}"
JB 580  PRINT"{BLU}ENTER TITLE
        {SPACE}OF SONG #"N":
        {PUR}"
CJ 590  N$(N)="":INPUTN$(N):IFN
        $(N)=""THENPRINT"{UP}";
        :GOTO590
RG 600  N$(N)=LEFT$(N$(N),20):P
        RINT"{DOWN}{BLU}OK, ENT
        ER {PUR}"N$(N)":{RED}"
DC 610  PRINT:P=0:SYS49152
BD 620  GETT$:IFT$=""THEN620
KJ 630  IFT$=CHR$(13)THEN650
FE 640  PRINTT$;:P=P+1:IFP<254T
        HEN620
SA 650  P=0:SYS49152
GX 660  P=P+1:IFPEEK(1703+P)<>3
        2THENP$=P$+CHR$(PEEK(17
        03+P)+64):GOTO660
XG 670  IFP$=""THENN=N-1:GOTO24
        0
DS 680  PRINT"{CLR}{RED}SONG #
        {BLK}"N"{RED}CALLED
        {PUR}"N$(N)"{RED}:":M$(
        N)=P$+".":PRINT"{DOWN}"
        M$(N):P$=""
MA 690  SP=33:GOTO430
EX 700  IFN=0THEN230
DD 710  U=0:R=4:GOSUB810:FORI=1
        TON:IF(I-U*16+U)/16=INT
        ((I-U*16+U)/16)THEN730
SR 720  PRINTTAB(5-LEN(STR$(I))
        )"{BLK}"I"{8 SPACES}
        {PUR}"N$(I):NEXT
MB 730  PRINT"{DOWN}{RED}PRESS
        {SPACE}{RVS}M{OFF} FOR
        {SPACE}MORE":Y$=">":GOS
        UB800
FJ 740  GETA$:IFA$=""THEN740
FX 750  IFA$=CHR$(17)THENY$=" "
        :GOSUB800:R=R-(R<>(I+2-
        U*15)):Y$=">":GOSUB800
MA 760  IFA$=CHR$(145)THENY$="
        {SPACE}":GOSUB800:R=R+(
        R<>4):Y$=">":GOSUB800
AK 770  IFA$=CHR$(13)THENSN=U*1
        5+R-3:GOTO840
CS 780  IFA$="M"ANDI<=NTHENU=U+
        1:R=4:Y$=">":GOSUB800:G
        OSUB810:GOTO720
DK 790  GOTO740
FR 800  POKE214,R:PRINT:PRINT"
        {BLK} "Y$:RETURN
SC 810  PRINT"{CLR}{RED}LOCATE
        {SPACE}ARROW WITH CURSO
        R KEYS AND"
DH 820  PRINT"PRESS <RETURN> TO
         PICK A TUNE.":PRINT
AH 830  PRINTTAB(2)"{BLK}SONG #
```

```
        "TAB(15)"TITLE{DOWN}":R
        ETURN
CS 840  PRINT"{CLR}{RED}A SONG
        {SPACE}CALLED {PUR}"N$(
        SN)"{RED}:":PRINT"
        {DOWN}"M$(SN):PRINT"
        {BLK}":GOTO430
QM 850  IFN=0THEN230
BF 860  X$="":PRINT"{CLR}ENTER
        {SPACE}FILENAME: ";:INP
        UTX$:IFX$=""THEN240
RC 870  X$="0:"+X$:IFQ=4THEN910
CG 880  OPEN1,8,8,X$+",S,R":GOS
        UB950
JP 890  INPUT#1,N:FORI=1TON:INP
        UT#1,N$(I):NEXT:FORI=1T
        ON
RA 900  SYS49250,A$:M$(I)=LEFT$
        (A$,PEEK(4)):NEXT:GOSUB
        950:CLOSE1:GOSUB950:GOT
        O240
HS 910  CLOSE15:OPEN15,8,15,"S"
        +X$:CLOSE15
PM 920  O=0:OPEN1,8,8,X$+",S,W"
        :GOSUB950
EH 930  PRINT#1,N:FORI=1TON:PRI
        NT#1,N$(I):NEXT
HP 940  FORI=1TON:PRINT#1,M$(I)
        ;:NEXT:GOSUB950:CLOSE1:
        GOSUB950:GOTO240
EJ 950  IFO=0THENOPEN15,8,15:O=
        1
QJ 960  INPUT#15,A,B$,C,D:IFATH
        ENPRINTA,B$,C,D:STOP
MC 970  RETURN
```

Program 2: Read-A-Tune—VIC Version

```
HJ 10   PRINT"{CLR}LOADING ML...
        ":FORI=1TO255:A$=A$+" ":
        NEXT
BA 20   NS=25:IFPEEK(644)>64THEN
        NS=55
GA 30   DIMM$(NS),N$(NS):FORI=82
        8TO867:READA:POKEI,A:CK=
        CK+A:NEXT
PH 40   IFCK<>5021THENPRINT"ERRO
        R IN 1ST DATA STATEMENTS
        .":STOP
SP 50   DATA 32,253,206,32,139,2
        08,160,1,177,71
DB 60   DATA 133,2,200,177,71,13
        3,3,162,1,32
AA 70   DATA 198,255,160,0,32,20
        7,255,145,2,201
AX 80   DATA 46,240,3,200,208,24
        4,200,132,4,96
HK 90   DATA 162,191,160,234,173
        ,254,2,73,1,141
PX 100  DATA 254,2,141,255,2,24
        0,4,162,191,160
SR 110  DATA 2,120,142,20,3,140
        ,21,3,88,96
BJ 120  DATA 164,197,185,94,236
        ,56,233,65,201,190
EE 130  DATA 240,16,48,11,201,1
        5,176,7,168,185
KE 140  DATA 239,2,141,12,144,7
        6,191,234,238,255
EJ 150  DATA 2,173,255,2,201,40
        ,208,243,169,0
KF 160  DATA 141,12,144,141,255
        ,2,240,233,219,223
GC 170  DATA 195,201,207,209,21
        5,225,228,231,232,235
BQ 180  DATA 175,183,191,0,0
QA 190  CK=0:FORJ=673TO767:READ
        A:POKEJ,A:CK=CK+A:NEXT
EP 200  IFCK<>13287THENPRINT"ER
        ROR IN 2ND DATA STATEME
        NTS.":STOP
PR 210  POKE36878,12:R=36876:DI
        MH(15):FORI=1TO15:READH
        (I):NEXT:REMNOTES
QE 220  DATA 219,223,195,201,20
        7,209,215,225,228,231,2
        32,235,175,183,191
JA 230  PRINT"{CLR}{DOWN} {BLU}
        {RVS}THE VIC READ-A-TUN
        E!{OFF}"
FE 240  PRINT"{2 DOWN}1=WRITE A
         SONG":PRINT"{DOWN}2=PL
        AY BACK YOUR SONG"
AD 250  PRINT"{DOWN}3=RECALL YO
        UR SONGS":PRINT"{DOWN}4
        =SAVE YOUR SONGS"
KC 260  PRINT"{DOWN}5=12TH STRE
        ET RAG":PRINT"{DOWN}6=Y
        ANKEE DOODLE"
EP 270  PRINT"{DOWN}7=SOME FAST
         SCALES!":PRINT"{DOWN}8
        =END OF PROGRAM"
ED 280  PRINT"{2 DOWN}SELECT ON
        E:"
KD 290  D$="HBAHBAHBAHBAHBAAHBA
        HHAHBAAEREEDRHBAHBAHBAH
        BAHBAAHBAHHAHBAAEEFFGG"
HD 300  D$=D$+"HBAHBAHBAHBAHBAA
        HBAHHAHBAAEREEDRFFGAGGA
        BABHIHBAGHHGAAGEECCCRHH
        HR."
KB 310  E$="HRHRIRJRHRJRIRGRHRH
        RIRJRHHHHBBGGHRHRIRJRKR
        JRIRHRBRGRARBRHHHRHHHR"
XB 320  E$=E$+"AAABAAGGAABBHHHR
        GGGAGGFFEEFFGGGRAAABAAG
        GAABBHHAAGGHHBBIIHHHRHH
        HR."
RR 330  F$="HHHHGRGRAAAAGGGGRRR
        RBBBBHHHHCCCRR."
RE 340  GETQ$:IFQ$=""THEN340
FC 350  Q=VAL(Q$):ONQGOTO500,69
        0,850,840,390,400,370,4
        10
FM 360  GOTO340
AQ 370  PRINT"{CLR}{BLK}
        {5 SPACES}FAST SCALES!"
        :SP=22:PRINT
XH 380  PRINT"{DOWN}MMNOCCDEFGA
        BHHHIJKLKJIHHBAGFEDCCON
        MMNOCDCDEFGABHIHBAGFEDC
        RCECRCECR."
DP 381  GOTO420
HD 390  PRINT"{CLR}{BLK} TWELFT
        H STREET RAG":PRINT"
        {2 DOWN}"D$:SP=25:GOTO4
        20
MH 400  PRINT"{CLR}{BLK}
        {3 SPACES}YANKEE DOODLE
        ":PRINT"{2 DOWN}"E$:SP=
        35:GOTO420
JQ 410  PRINT"{CLR}{RED}THAT'S
        {SPACE}ALL!{BLK}":CLOSE
        15:END
PH 420  X=0
KD 430  X=X+1:P=4152+X:PP=PEEK(
        P)
RQ 440  IFPP=180RPP=32THENPOKER
        ,0:GOTO480
RD 450  IFPP=46THENPOKER,0:GOTO
        230
BF 460  IFPP>15THEN430
GD 470  POKER,H(PP)
QS 480  FORI=1TOSP:NEXT:PP=PP+1
        28:POKEP,PP:FORI=1TOSP:
        NEXT
QQ 490  PP=PP-128:POKEP,PP:GOTO
        430
KE 500  N=N+1:IFN>NSTHENPRINT"
        {CLR}{2 DOWN}TOO MANY T
        UNES!":FORDE=1TO1000:NE
        XT:N=N-1:GOTO230
BD 510  PRINT"{CLR}{RED}{BLK}TH
        ESE ARE THE NOTES:":PRI
        NT"M=LOW G{3 SPACES}N=L
        OW A{5 SPACES}O=LOW B
        {3 SPACES}C=MID C"
AB 520  PRINT"D=MID D{3 SPACES}
        E=MID E{5 SPACES}F=MID
        {SPACE}F{3 SPACES}G=MID
         G{5 SPACES}A=MID A
        {3 SPACES}B=MID B"
AC 530  PRINT"H=HIGH C
        {2 SPACES}I=HIGH D
        {4 SPACES}J=HIGH E
        {2 SPACES}K=HIGH F
        {4 SPACES}L=HIGH G
        {2 SPACES}R=REST"
AH 540  PRINT"{BLU}TITLE OF SON
        G #"N":{PUR}":PRINT"
        {2 SPACES}.....
        ..{UP}"
HJ 550  N$(N)="":INPUTN$(N):IFN
        $(N)=""THENPRINT"{UP}";
        :GOTO550
HF 560  N$(N)=LEFT$(N$(N),15)
XF 570  FORJ=1TO15:IFMID$(N$(N)
        ,J,1)="."THENN$(N)=LEFT
        $(N$(N),J-1):J=15
QG 580  NEXT
KX 590  PRINT"{2 UP}{DOWN}{BLU}
        ENTER {PUR}"N$(N)"{RED}
        "
AA 600  P=0:SYS673
DB 610  GETT$:IFT$=""THEN610
PS 620  IFT$=CHR$(13)THEN640
CB 630  PRINTT$;:P=P+1:IFP<254T
        HEN610
RF 640  P=0:SYS673:POKER,0
RE 650  P=P+1:IFPEEK(4337+P)<>3
        2THENP$=P$+CHR$(PEEK(43
        37+P)+64):GOTO650
GP 660  IFP$=""THENN=N-1:GOTO23
        0
HG 670  PRINT"{CLR}{RED}SONG #
        {BLK}"N"{RED}CALLED
        {PUR}":PRINTN$(N)"{RED}
        :":M$(N)=P$+".":PRINT"
        {DOWN}"M$(N):P$=""
HD 680  SP=33:GOTO420
RS 690  IFN=0THEN230
EG 700  U=0:RR=5:GOSUB800:FORI=
        1TON:IF(I-U*16+U)/16=IN
        T((I-U*16+U)/16)THEN720
BA 710  PRINTTAB(3-LEN(STR$(I))
        )"{BLK}"I"{2 SPACES}
        {PUR}"N$(I):NEXT
JX 720  PRINT"{DOWN}{RED}TYPE
        {RVS}M{OFF} FOR MORE";:
        Y$=">":GOSUB790
HS 730  GETA$:IFA$=""THEN730
EM 740  IFA$=CHR$(17)THENY$=" "
        :GOSUB790:RR=RR-(RR<>(I
        +3-U*15)):Y$=">":GOSUB7
        90
KK 750  IFA$=CHR$(145)THENY$="
        {SPACE}":GOSUB790:RR=RR
        +(RR<>5):Y$=">":GOSUB79
        0
EJ 760  IFA$=CHR$(13)THENSN=U*1
        5+RR-4:GOTO830
XC 770  IFA$="M"ANDI<=NTHENU=U+
        1:RR=5:Y$=">":GOSUB790:
        GOSUB800:GOTO710
SH 780  GOTO730
XS 790  POKE214,RR:PRINT:PRINT"
        {BLK}"Y$:RETURN
BQ 800  PRINT"{CLR}{RED}LOCATE
        {SPACE}ARROW WITH":PRIN
        T"CURSOR KEYS AND PRESS
        ";
EB 810  PRINT"{RVS}RETURN{OFF}
        {SPACE}TO PICK A ";:PRI
        NT"TUNE."
HS 820  PRINT"{BLK}SONG #"TAB(1
        0)"TITLE{DOWN}":RETURN
```

```
PA 830 PRINT"{CLR}{RED}A SONG
       {SPACE}CALLED {PUR}":PR
       INTN$(SN)"{RED}:":PRINT
       "{DOWN}"M$(SN):PRINT"
       {BLK}":SP=33:GOTO420
AM 840 IFN=0THEN230
MK 850 X$="":PRINT"{CLR}ENTER
       {SPACE}FILENAME:":INPUT
       X$:IFX$=""THEN230
CA 860 X$="0:"+X$:IFQ=4THEN900
HJ 870 OPEN1,8,8,X$+",S,R":GOS
       UB940
QM 880 INPUT#1,N:FORI=1TON:INP
       UT#1,N$(I):NEXT:FORI=1T
       ON
PS 890 SYS828,A$:M$(I)=LEFT$(A
       $,PEEK(4)):NEXT:GOSUB94
       0:CLOSE1:GOSUB940:GOTO2
       30
PS 900 CLOSE15:OPEN15,8,15,"S"
       +X$:CLOSE15
RK 910 O=0:OPEN1,8,8,X$+",S,W"
       :GOSUB940
KD 920 PRINT#1,N:FORI=1TON:PRI
       NT#1,N$(I):NEXT:FORI=1T
       ON
FB 930 PRINT#1,M$(I);:NEXT:GOS
       UB940:CLOSE1:GOSUB940:G
       OTO230
AK 940 IFO=0THENOPEN15,8,15:O=
       1
XA 950 INPUT#15,A,B$,C,D:IFATH
       ENPRINT"{2 DOWN}{RVS}"B
       $:STOP
SD 960 RETURN
```

Program 3: Read-A-Tune—Plus/4 and 16 Version

```
HJ 10 PRINT"{CLR}LOADING ML...
      ":FORI=1TO255:A$=A$+" ":
      NEXT
RP 20 NS=190:IFPEEK(1332)=63TH
      ENNS=25
PA 30 DIMM$(NS),N$(NS):FORI=81
      9TO984:READA:POKEI,A:CK=
      CK+A:NEXT
RR 40 IFCK<>18080THENPRINT"ERR
      OR IN DATA STATEMENTS.":
      STOP
JM 50 DATA 162,14,160,206,173,
      175,3,73,1,141
GS 60 DATA 175,3,240,4,162,78,
      160,3,120,142
BD 70 DATA 20,3,140,21,3,88,96
      ,172,246,7
QS 80 DATA 185,38,224,56,233,6
      5,201,190,240,32
PG 90 DATA 48,27,201,15,176,23
      ,168,169,23,141
BH 100 DATA 17,255,173,18,255,
       41,252,25,160,3
AS 110 DATA 141,18,255,185,145
       ,3,141,14,255,76
EC 120 DATA 14,206,238,176,3,1
       73,176,3,201,45
AG 130 DATA 208,243,169,0,141,
       176,3,169,16,141
KD 140 DATA 17,255,208,231,2,3
       0,84,131,173,193
GJ 150 DATA 227,42,66,86,96,11
       3,197,4,59,3
GJ 160 DATA 3,2,2,2,2,2,3,3,3,
       3
RC 170 DATA 3,1,2,2,0,0
EA 180 DATA 32,145,148,32,165,
       150,160,1,177,71
QR 190 DATA 133,159,200,177,71
       ,133,160,162,1,32
QJ 200 DATA 198,255,160,0,32,2
       07,255,145,159,201
BK 210 DATA 46,240,3,200,208,2
       44,200,132,161,96
CR 220 DIMH(15):FORI=1TO15:REA
       DH(I):NEXT:REM NOTE DAT
       A
AQ 230 DATA 770,798,596,643,68
       5,705,739,810,834
MJ 240 DATA 854,864,881,453,51
       6,571
FF 250 COLOR0,2,7:COLOR4,3,2
XE 260 IFENTHENPRINT"{CLR}":CL
       OSE15:END
KG 270 PRINT"{CLR}{2 DOWN}
       {BLK}{5 SPACES}{RVS} TH
       E READ-A-TUNE MUSIC SYS
       TEM! {OFF}"
HK 280 PRINT,"{2 DOWN}1=WRITE
       {SPACE}A SONG":PRINT,"
       {DOWN}2=PLAY BACK YOUR
       {SPACE}SONG"
CX 290 PRINT,"{DOWN}3=RECALL Y
       OUR SONGS":PRINT,"
       {DOWN}4=SAVE YOUR SONGS
       "
HX 300 PRINT,"{DOWN}5=12TH STR
       EET RAG":PRINT,"{DOWN}6
       =YANKEE DOODLE"
DQ 310 PRINT,"{DOWN}7=SOME REA
       LLY FAST SCALES!":PRINT
       ,"{DOWN}8=END OF PROGRA
       M"
MQ 320 PRINT,"{2 DOWN}SELECT O
       NE:"
SB 330 D$="HBAHBAHBAHBAHBAAHBA
       HHAHBAAEREEDRHBAHBAHBAH
       BAHBAAHBAHHAHBAAEEFFGG"
HG 340 D$=D$+"HBAHBAHBAHBAHBAA
       HBAHHAHBAAEREEDRFFGAGGA
       BABHIHBAGHHGAAGEECCCRHH
       HR."
MS 350 E$="HRHRIRJRHRJRIRGRHRH
       RIRJRHHHHBBGGHRHRIRJRKR
       JRIRHRBRGRARBRHHHRHHHR"
XE 360 E$=E$+"AAABAAGGAABBHHHR
       GGGAGGFFEEFFGGGRAAABAAG
       GAABBHHAAGGHHBBIIHHHRHH
       HR."
MM 370 F$="HHHGRGRAAAGGGRRRBBB
       HHHCCRR."
JS 380 G$="MNOCDEFGABHIJKLLRRL
       KJIHBAGFEDCONMMRRCDEFGA
       BHBAGFEDCCRRCDEFGABHBAG
       FEDC."
PX 390 GETQ$:IFQ$=""THEN390
BQ 400 Q=VAL(Q$):ONQGOTO540,72
       0,880,870,430,440,420,4
       50
SA 410 GOTO390
DQ 420 PRINT"{CLR}{BLK}
       {7 SPACES}SOME REALLY F
       AST SCALES!":PRINT"
       {DOWN}"G$:SP=5:GOTO460
HX 430 PRINT"{CLR}{BLK}"," TWE
       LFTH STREET RAG
       {2 SPACES}":PRINT"
       {DOWN}"D$:SP=9:GOTO460
XM 440 PRINT"{CLR}{BLK}","
       {3 SPACES}YANKEE DOODLE
       ":PRINT"{DOWN}"E$:SP=9:
       GOTO460
CJ 450 PRINT"{CLR}{RED}","
       {2 SPACES}THAT'S ALL!
       {BLK}":PRINT"{DOWN}"F$:
       SP=8:EN=1
PM 460 X=0
CB 470 X=X+1:P=3151+X:PP=PEEK(
       P)
AM 480 IFPP=18ORPP=32THENVOL0:
       GOTO520
DH 490 IFPP=46THENVOL0:GOTO260
EC 500 IFPP<10RPP>15THEN470
JE 510 VOL7:SOUND1,H(PP),SP
CC 520 FORT=1TOSP:NEXT:PP=PP+1
       28:POKEP,PP:FORT=1TOSP:
       NEXT
JD 530 PP=PP-128:POKEP,PP:GOTO
       470
GM 540 N=N+1:IFN>NSTHENPRINT"
       {CLR}{2 DOWN}TOO MANY T
       UNES!":FORDE=1TO1000:NE
       XT:N=N-1:GOTO270
AQ 550 PRINT"{CLR}{DOWN}{BLU}S
       O YOU'RE READY TO WRITE
       A SONG!"
DB 560 PRINT"{2 DOWN}{BLK}HERE
       ARE THE NOTES:":PRINT"
       {DOWN}M=LOW G{3 SPACES}
       N=LOW A{4 SPACES}O=LOW
       {SPACE}B"
DD 570 PRINT"C=MID C{3 SPACES}
       D=MID D{4 SPACES}E=MID
       {SPACE}E{3 SPACES}F=MID
       F"
XR 580 PRINT"G=MID G{3 SPACES}
       A=MID A{4 SPACES}B=MID
       {SPACE}B{3 SPACES}H=HIG
       H C"
XE 590 PRINT"I=HIGH D
       {2 SPACES}J=HIGH E
       {3 SPACES}K=HIGH F
       {2 SPACES}L=HIGH G":PRI
       NT"R=REST{DOWN}"
DA 600 PRINT"{BLU}ENTER TITLE
       {SPACE}OF SONG #"N":
       {PUR}"
QS 610 N$(N)="":INPUTN$(N):IFN
       $(N)=""THENPRINT"{UP}";
       :GOTO610
FA 620 N$(N)=LEFT$(N$(N),20):P
       RINT"{DOWN}{BLU}OK, ENT
       ER {PUR}"N$(N)":{RED}"
JG 630 PRINT:P=0:VOL7:SYS819
FX 640 GETT$:IFT$=""THEN640
QE 650 IFT$=CHR$(13)THEN670
CK 660 PRINTT$;:P=P+1:IFP<254T
       HEN640
ED 670 P=0:SYS819:VOL0
XR 680 P=P+1:IFPEEK(3751+P)<>3
       2THENP$=P$+CHR$(PEEK(37
       51+P)+64):GOTO680
FB 690 IFP$=""THENN=N-1:GOTO27
       0
ES 700 PRINT"{CLR}{RED}SONG #
       {BLK}"N"{RED}CALLED
       {PUR}"N$(N)"{RED}:":M$(
       N)=P$+".":PRINT"{DOWN}"
       M$(N):P$=""
SB 710 SP=10:GOTO460
PB 720 IFN=0THEN270
JG 730 U=0:R=4:GOSUB830:FORI=1
       TON:IF(I-U*16+U)/16=INT
       ((I-U*16+U)/16)THEN750
GQ 740 PRINTTAB(5-LEN(STR$(I))
       )"{BLK}"I"{8 SPACES}
       {PUR}"N$(I):NEXT
EJ 750 PRINT"{DOWN}{RED}PRESS
       {SPACE}{RVS}M{OFF} FOR
       {SPACE}MORE":Y$=">":GOS
       UB820
JE 760 GETA$:IFA$=""THEN760
SS 770 IFA$=CHR$(17)THENY$=" "
       :GOSUB820:R=R-(R<>(I+2-
       U*15)):Y$=">":GOSUB820
RG 780 IFA$=CHR$(145)THENY$="
       {SPACE}":GOSUB820:R=R+(
       R<>4):Y$=">":GOSUB820
EH 790 IFA$=CHR$(13)THENSN=U*1
       5+R-3:GOTO860
KD 800 IFA$="M"ANDI<=NTHENU=U+
       1:R=4:Y$=">":GOSUB820:G
       OSUB830:GOTO740
MJ 810 GOTO760
QS 820 POKE205,R:PRINT:PRINT"
       {BLK} "Y$:RETURN
```

```
GF 830 PRINT"{CLR}{RED}LOCATE
       {SPACE}ARROW WITH CURSO
       R KEYS AND"
PE 840 PRINT"PRESS <RETURN> TO
        PICK A TUNE.":PRINT
JJ 850 PRINTTAB(2)"{BLK}SONG #
       "TAB(15)"TITLE{DOWN}":R
       ETURN
RR 860 PRINT"{CLR}{RED}A SONG
       {SPACE}CALLED {PUR}"N$(
       SN)"{RED}:":PRINT"
       {DOWN}"M$(SN):PRINT"
       {BLK}":SP=10:GOTO460
SS 870 IFN=0THEN260
GB 880 X$="":PRINT"{CLR}ENTER
       {SPACE}FILENAME: ";:INP
       UTX$:IFX$=""THEN270
DK 890 X$="0:"+X$:IFQ=4THEN930
DC 900 OPEN1,8,8,X$+",S,R":GOS
       UB970
DJ 910 INPUT#1,N:FORI=1TON:INP
       UT#1,N$(I):NEXT:FORI=1T
       ON
XJ 920 SYS945,A$:M$(I)=LEFT$(A
       $,PEEK(161)):NEXT:GOSUB
       970:CLOSE1:GOSUB970:GOT
       O270
XQ 930 CLOSE15:OPEN15,8,15,"S"
       +X$:CLOSE15
HB 940 O=0:OPEN1,8,8,X$+",S,W"
       :GOSUB970
QE 950 PRINT#1,N:FORI=1TON:PRI
       NT#1,N$(I):NEXT
RB 960 FORI=1TON:PRINT#1,M$(I)
       ;:NEXT:GOSUB970:CLOSE1:
       GOSUB970:GOTO270
QM 970 IFO=0THENOPEN15,8,15:O=
       1
EP 980 INPUT#15,A,B$,C,D:IFATH
       ENPRINTA,B$,C,D:STOP
CE 990 RETURN
```

Power BASIC: Blick

Article on page 84.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Blick—64 Version

```
DP 100 FORI=679TO758:READA:POK
       EI,A:CK=CK+A:NEXT
BP 110 IFCK<>11167THENPRINT"ER
       ROR IN DATA STATEMENTS.
       ":STOP
BD 120 SYS679:PRINT"BLICK ENAB
       LED":NEW
SF 130 DATA 169,15,141,24,212,
       141,19,212,169,120
SM 140 DATA 141,15,212,169,1,1
       41,14,212,169,0
JX 150 DATA 141,20,212,162,201
       ,160,2,142,38,3
MC 160 DATA 140,39,3,96,32,202
       ,241,133,251,134
MD 170 DATA 252,132,253,169,33
       ,141,18,212,169,175
MP 180 DATA 32,202,241,162,234
       ,160,0,200,208,253
BH 190 DATA 232,208,250,169,32
       ,141,18,212,169,20
RM 200 DATA 32,202,241,165,251
       ,166,252,164,253,96
```

Program 2: Blick—VIC Version

```
AF 100 FORI=673TO734:READA:POK
       EI,A:CK=CK+A:NEXT
PQ 110 IFCK<>8745THENPRINT"ERR
       OR IN DATA STATEMENTS."
       :STOP
PS 120 SYS673:PRINT"BLICK ENAB
       LED":NEW
KE 130 DATA 169,15,141,14,144,
       162,177,160,2,142
CC 140 DATA 38,3,140,39,3,96,3
       2,122,242,133
SR 150 DATA 251,134,252,132,25
       3,169,238,141,12,144
HD 160 DATA 169,175,32,122,242
       ,162,234,160,0,200
KK 170 DATA 208,253,232,208,25
       0,169,20,32,122,242
AB 180 DATA 169,0,141,12,144,1
       65,251,166,252,164
MM 190 DATA 253,96
```

Program 3: Blick—Plus/4 And 16 Version

```
BP 100 FORI=1015TO1086:READA:P
       OKEI,A:CK=CK+A:NEXT
FP 110 IFCK<>9280THENPRINT"ERR
       OR IN DATA STATEMENTS."
       :STOP
XB 120 SYS1015:PRINT"BLICK ENA
       BLED":NEW
RR 130 DATA 162,2,160,4,142,36
       ,3,140,37,3
CF 140 DATA 96,32,75,236,133,1
       59,134,160,132,161
XM 150 DATA 169,23,141,17,255,
       169,129,141,14,255
JQ 160 DATA 173,18,255,41,252,
       9,3,141,18,255
AK 170 DATA 169,175,32,75,236,
       162,234,160,0,200
FB 180 DATA 208,253,232,208,25
       0,169,20,32,75,236
BH 190 DATA 169,16,141,17,255,
       165,159,166,160,164
AP 200 DATA 161,96
```

Program 4: Blick—128 Version

```
BA 100 FORI=3072TO3158:READA:P
       OKEI,A:CK=CK+A:NEXT
XD 110 IFCK<>10998THENPRINT"ER
       ROR IN DATA STATEMENTS.
       ":STOP
FE 120 SYS3072:PRINT"BLICK ENA
       BLED":NEW
SF 130 DATA 169,15,141,24,212,
       141,19,212,169,120
SM 140 DATA 141,15,212,169,1,1
       41,14,212,169,0
RH 150 DATA 141,20,212,162,34,
       160,12,142,38,3
QG 160 DATA 140,39,3,96,72,169
       ,0,141,0,255
SD 170 DATA 104,32,121,239,133
       ,167,134,168,132,169
FG 180 DATA 169,33,141,18,212,
       169,175,32,121,239
PS 190 DATA 162,234,160,0,200,
       208,253,232,208,250
SS 200 DATA 169,32,141,18,212,
       169,20,32,121,239
EF 210 DATA 165,167,166,168,16
       4,169,96
```

Vampyre Hunter

See instructions in article on page 42 before beginning to type.

Program 1: Vampyre Hunter—BASIC Portion

```
DD 10 IF A=0 THEN A=1:LOAD "VA
      MPYRE.ML",8,1
XR 15 IFPEEK(49152)<>18THENPRI
      NT"ML?":STOP
RA 20 SP=53269:BO=53280:SC=532
      81:PRINT"{CLR}":POKEBO,2
      :POKESC,2
MB 25 DEFFNA(I)=PEEK(I)+256*PE
      EK(I+1):DEFFND(I)=INT(RN
      D(1)*I)
PK 30 I=49152:IZ=FNA(I):MV=FNA
      (I+2):WK=FNA(I+4):BP=FNA
      (I+6):CS=FNA(I+8)
JX 35 MT=FNA(I+10):MB=FNA(I+12
      ):MR=FNA(I+14):EV=FNA(I+
      16)
GA 40 SYSIZ:PRINT"{CLR}{H}
      {3 DOWN}{33}"TAB(13)"VAMP
      YRE HUNTER"
HK 45 SYSCS:SYSMT:POKEBO,2:POK
      ESC,2
MR 50 S8$="{F}{HOME}{RVS}
      {40 SPACES}{HOME}"
XX 55 DL$="{F}{38 SPACES}{B}"
DM 60 S1$=" ":S4$="{4 SPACES}"
      :READNT,MW,SL,MS,Q,X,Z,W
      F,PE$,AR$,DR$,D1$,DN$,DR
      ,TN,VE,NO
SG 65 READSO,FO,LF,PL,RS,MC,BC
      ,NE,DE,WV,IO,SV,WS,AL$,B
      U$,CD$,DY,TT,XS,YS,LS
DA 70 READBH,RH,DH,CH,TH,OS,SH
      ,WC,VR,NG,AF,NU,VH,SE
ED 75 CD=LEN(CD$)-X:DIMCD$(CD)
      ,DR$(DR),TN$(TN),TN(TN),
      VE$(VE),NO$(NO),NP%(NO)
EM 80 DIMNW%(NO),NS%(NO),ND$(N
      O),SH%(NO),NE%(NO+X),MS%
      (MS),SO%(SO),SO$(SO)
GR 85 DIMFO%(FO),NU%(FO),FD$(F
      O),PN$(PL),PD%(PL+X),PP$
      (PL),PS$(PL),PV%(PL)
ER 90 DIMRD$(RS),BC%(MC+X),BC$
      (BC),NE$(NE),DE$(DE),WV%
      (WV),IO%(NO),SV%(SV)
GP 95 DIMWS%(NO),WO$(SL),ND%(S
      L),NC%(SL),DD%(2,5),CC$(
      2),CC(2),ER$(8),SE%(SE)
QF 100 FORI=0TO2:FORJ=0TO5:REA
       DDD%(I,J):NEXT:NEXT
RQ 105 FORI=0TOCD:READCD$(I):N
       EXT:FORI=0TODR:READDR$(
       I):NEXT:FORI=0TOTN
CR 110 READTN$(I),TN(I):NEXT:F
       ORI=0TOVE:READVE$(I):NE
       XT:FORI=0TOMS:MS%(I)=-2
       :NEXT
CS 115 FORI=0TONO:READNO$(I),N
       P%(I),NW%(I),ND$(I),NS%
       (I):NEXT
GC 120 FORI=0TOSO:READSO%(I),S
       O$(I):NEXT:FORI=0TOSO:S
       H%(SO%(I))=I+X:NEXT
BM 125 FORI=0TOFO:READFO%(I),N
       U%(I):NEXT
CS 130 FORI=0TOFO:READFD$(I):N
       EXT:FORI=0TOPL:READPN$(
       I),PP$(I),PS$(I):NEXT
BM 135 FORI=0TORS:READRD$(I):N
       EXT:J=0:FORI=0TOBC
```

```
AB 140 READBC$(I):IFBC$(I)=Z$T
       HENJ=J+X:BC%(J)=I:GOTO1
       40
DH 145 NEXT:BC%(J+X)=BC+X:J=Ø:
       FORI=ØTONE
KM 150 READNE$(I):IFNE$(I)=Z$T
       HENJ=J+X:NE%(J)=I:GOTO1
       50
EM 155 NEXT:NE%(J+X)=NE+X:J=Ø:
       FORI=ØTODE
CB 160 READDE$(I):IFDE$(I)=Z$T
       HENJ=J+X:PD%(J)=I:GOTO1
       60
JC 165 NEXT:PD%(J+X)=DE+X:NW%(
       6)=NS%(6)*2
ER 170 FORI=ØTOWV:READWV%(I):N
       EXT:FORI=ØTOIO:READJ:IO
       %(J)=Q:NEXT
GE 175 FORI=ØTOSV:READSV%(I):N
       EXT:FORI=ØTOWS:READN,J:
       WS%(N)=J:NEXT
EC 180 FORI=ØTO2:READCC$(I),CC
       (I):NEXT:FORI=ØTO8:READ
       ER$(I):NEXT
EB 185 I=53248:POKEI+23,Ø:POKE
       I+29,Ø:POKEI+27,Ø:POKEI
       +28,Ø:POKEI+16,Ø:POKEI,
       184
HR 190 POKEI+21,Ø:POKEI+1,114:
       K=65472:FORI=ØTO47:READ
       J:POKEI+K,J:NEXT
PA 195 FORI=48TO63:POKEI+K,Ø:N
       EXT:POKE53240,255:FORI=
       ØTOSE:READSE%(I):NEXT
QB 200 S2=Q:POKENG,Ø:SYSEV:PRI
       NT"{CLR}{2 DOWN}WELCOME
       ! TO VAMPYRE HUNTER
       {4 DOWN}":GOSUB830
XP 205 GOSUB1865:PV%(Ø)=Q:T3=T
       T:T4=TT
QR 210 :
SK 215 PRINT:IFICTHENPOKE214,2
       Ø:PRINT:PRINTDL$DL$:POK
       E214,20:PRINT
MC 220 PRINT"? ";:GOSUB2760:IF
       NOTICTHEN235
EM 225 PRINT"{CLR}":IFLNTHENSY
       SMV
FG 230 POKE214,17:PRINT
MJ 235 IFHV>5THENPRINT"I NEED
       {SPACE}SOME REST.
QF 240 IFNU<30THENPRINT"I'M HU
       NGRY.
HS 245 IFHV>9THENGOSUB575:PRIN
       T"YOU DIED OF EXHAUSTIO
       N AT"T1-T;T$PE$:GOTO520
MQ 250 IFNU<-10THENPRINT"YOU H
       AVE STARVED TO DEATH ON
        DAY"DY"{LEFT}.":GOTO52
       Ø
HC 255 IFIN$="AGAIN"THENIN$=J$
       :PRINT"("J$")
EC 260 J$=IN$
RC 265 IFZL=QTHENPRINT"COME AG
       AIN?":GOTO215
PK 270 IN$=IN$+S1$:FORI=ØTOSL:
       WO$(I)=PE$:NEXT:WN=Ø:J=
       X
AD 275 IFMID$(IN$,J,X)<>S1$THE
       N295
CH 280 WO$(WN)=LEFT$(LEFT$(IN$
       ,J-X)+S4$,4):IN$=MID$(I
       N$,J+X):J=Ø
KR 285 FORI=1TOLEN(AR$)STEP4:I
       FWO$(WN)=MID$(AR$,I,4)T
       HENWO$(WN)=PE$:GOTO295
MH 290 NEXT:WN=WN+X
FE 295 J=J+X:IFNOTJ>LEN(IN$)TH
       EN275
XX 300 NW=Ø
KA 305 IN$=WO$(NW):IFIN$=PE$TH
       EN215
DK 310 GOSUB800:IFNOT(VF>ØANDN
       P%(VR)<>67ANDNOTNT)THEN
       320
KJ 315 PRINT"THE VAMPIRE LOOKS
        UP INTO THE SUN AND ME
       LTS AWAY.":GOTO505
QR 320 FORI=1TOLEN(DR$)STEP4
KG 325 IFIN$=MID$(DR$,I,4)THEN
       V=Ø:GOTO350
KG 330 NEXT
MB 335 NW=NW+X:FORI=ØTOVE:FORJ
       =1TOLEN(VE$(I))STEP4
GS 340 IFIN$=MID$(VE$(I),J,4)T
       HENV=I:V1=(J-X)/4:GOTO3
       50
QK 345 NEXT:NEXT:PRINTER$(Ø):G
       OTO215
FB 350 ONV+XGOSUB1010,1010,129
       Ø,1420,1435,1550,1800,2
       415,2750,1975
CE 355 IFV>9THENONV-9GOSUB2120
       ,2250,2500,2650,2665,27
       15,535,540,765,770,545
RQ 360 IFV>20THENONV-20GOSUB22
       85,595,605,555,430,475,
       490,385,780,375
DQ 365 GOTO305
JJ 370 :
XJ 375 PRINT"{CLR}":GOTO820
EK 380 :
XM 385 GOSUB1595:IFNOTNC=XORNO
       TNC%(Ø)=19ORNOTNC%(1)=4
       ØTHENPRINTER$(Ø):RETURN
RE 390 N=19:GOSUB1645:IFNOTNL=
       QTHENPRINTER$(1)ND$(19)
       PE$:RETURN
AM 395 IFNOTNP%(8)=QTHENPRINT"
       I MUST HAVE THE MALLET.
       ":RETURN
SB 400 TX=CX:TY=CY:TL=CL:GOSUB
       2775
MJ 405 IFWH=VHORNTTHENPRINT"TH
       E VAMPIRE MUST BE ASLEE
       P.":RETURN
AD 410 IFNOTWH=CHTHENPRINTER$(
       2)"COFFIN HERE.":RETURN
XX 415 IFHV>5THENPRINT"YOU ARE
        TOO TIRED TO DO THIS D
       EED.":RETURN
JG 420 PRINT"YOU HAVE DRIVEN A
        WOODEN STAKE INTO THE
       {SPACE}VAMPIRE.":GOTO50
       5
PQ 425 :
RP 430 IN$=WO$(NW):NW=NW+X
CD 435 IFNOTAF>ØTHENPRINT"THER
       E IS NO FUEL.":RETURN
MX 440 N=5:GOSUB1645:IFNL=QTHE
       N460
MC 445 IFNL=ZTHENPRINTER$(2)ND
       $(N)" HERE.":RETURN
JR 450 PR=Q:GOSUB1385:GOSUB164
       5
FH 455 IFNOTNL=QTHENPRINTER$(1
       )ND$(N)PE$:RETURN
DH 460 IFIN$="ON{2 SPACES}"THE
       NTT=TT+3:LN=Q:PRINTND$(
       N)" IS NOW ON.":RETURN
AQ 465 IFIN$="OFF "THENTT=TT+2
       :LN=Z:PRINTND$(N)" IS N
       OW OFF.":RETURN
PH 470 NW=NW-X:PRINTER$(Ø):RET
       URN
XK 475 GOSUB1595:IFNOTNC=ØTHEN
       PRINTER$(Ø):RETURN
EE 480 IFNOTNC%(Ø)=5THENPRINT"
       YOU CAN NOT LIGHT THE "
       ND$(NC%(Ø))PE$:RETURN
RF 485 IN$="ON{2 SPACES}":GOTO
       435
XA 490 GOSUB1595:IFNOTNC=ØORNO
       TNC%(Ø)=5THENPRINTER$(Ø
       ):RETURN
AX 495 IN$="OFF ":GOTO435
FA 500 :
QA 505 GOSUB575:PRINT"THE VAMP
       IRE WAS KILLED ON DAY"D
       Y"{LEFT}, AT"T1-T;T$".
       {SPACE}";
CP 510 PRINT"CONGRATULATIONS,
       {SPACE}YOU ARE NOW THE
       {SPACE}CHAMPION VAMPYRE
        HUNTER!"
FC 515 :
ES 520 POKESP,Ø:PRINT"PLAY AGA
       IN? ";:GOSUB2760:IFLEFT
       $(IN$,1)="Y"THENRUN
PG 525 PRINT"{CLR}{TOP}":END
BC 530 :
CD 535 PRINT"WEEEE!!":RETURN
SC 540 PRINT"AGHHHH!!!":RETURN
PK 545 PRINT"HELLO!":RETURN
KD 550 :
RG 555 FORIP=ØTO2:PRINTCC$(IP)
       ;:GOSUB2760
EH 560 IFIN$>""ANDVI>=ØANDVI<1
       6THENPOKECC(IP),VI
RS 565 NEXT:RETURN
BF 570 :
MC 575 T$="A":T=Ø:IFTT>719THEN
       T$="P":T=12
HB 580 T1=INT(TT/60):T$="
       {LEFT}:"+RIGHT$("Ø"+MID
       $(STR$(INT((TT/60-T1)*6
       Ø)),2),2)+T$
JP 585 IFT1=ØTHENT1=12
AP 590 RETURN
GQ 595 GOSUB575:PRINT"IT'S"T1-
       T;T$" OF DAY"DY"{LEFT}.
       ":RETURN
CG 600 :
CB 605 GOSUB1595:IFNOTNC=1THEN
       PRINTER$(Ø):RETURN
RJ 610 IN=NC%(Z):DN=NC%(1):IFN
       OT(IN=5ANDDN=9)THEN635
GR 615 N=DN:GOSUB1645:IFNOTNL=
       QTHENPRINTER$(1)ND$(N)P
       E$:RETURN
AS 620 N=IN:GOSUB1645:IFNOTNL=
       QTHENPRINTER$(1)ND$(N)P
       E$:RETURN
FB 625 IFAF>500THENPRINT"THERE
        IS STILL TOO MUCH FUEL
        IN THE "ND$(N)PE$:RETU
       RN
BG 630 AF=AF+600:NP%(DN)=-2:PR
       INT"THE LAMP IS REFUELE
       D.":RETURN
FK 635 IFNOTIO%(IN)THENIN=NC%(
       1):DN=NC%(Ø)
GS 640 N=DN:GOSUB1645:IFNOTNL=
       QTHENPRINTER$(1)ND$(N)P
       E$:RETURN
GJ 645 N=IN:GOSUB1645:IFNL=ØTH
       ENPRINTER$(2)ND$(N)" HE
       RE.":RETURN
PM 650 TT=TT+5:IFNOTDN=6THENGO
       SUB1530:GOTO665
SS 655 IFNOTDN=6THENGOSUB1530:
       GOTO665
JS 660 N=DN:GOSUB2625
DA 665 IFNOTICTHEN695
AK 670 IFIN=40THEN685
AG 675 PRINTER$(7)ND$(DN)PE$:I
       FDN=6THENRETURN
EG 680 DN=LO:LO=80:GOSUB1535:L
       O=DN:RETURN
GC 685 FORI=ØTOSV:IFNOTDN=SV%(
       I)THENNEXT:GOTO675
HF 690 GOTO735
AB 695 PRINTND$(DN)":GIVEN.":I
       FNOTIN=2THEN710
```

```
MX 700 IFDN=6THENDF=Q:PRINT"TH
       E DOG IS FOLLOWING YOU
       {SPACE}NOW.":RETURN
EC 705 PRINTER$(5):RETURN
ER 710 IFNOTIN=3THEN725
EB 715 IFDN=6THENPRINT"THEY EA
       T HUNGRILY BUT STAY FOR
        MORE.":DG=Q:RETURN
JC 720 PRINTER$(5):RETURN
AA 725 IFIN=38ORIN=39THENPRINT
       ER$(5):RETURN
CF 730 FORI=0TOSV:IFNOTDN=SV%(
       I)THENNEXT:PRINTER$(5):
       RETURN
HJ 735 IFNOT(DN=11ORDN=14ORDN=
       15ORDN=18)THEN745
FM 740 PRINT"THE VAMPIRE CHANG
       ES INTO A BAT AND FLIES
        AWAY.":GOTO915
KB 745 NS%(DN)=0:NW%(DN)=NW%(D
       N)/3:ND$(DN)="EMPTY "+N
       D$(DN):IFDN<>13THEN740
GK 750 PRINT"THE VAMPIRE CLUTC
       HES WHERE THE HOLY WATE
       R HIT HIM ";
KR 755 PRINT"AND LUNGES AT YOU
        IN RAGE.":VF=5+FND(5):
       GOTO975
GB 760 :
RA 765 PRINT"BRIEF DESCRIPTION
       S.":DL=0:RETURN
CG 770 PRINT"VERBOSE DESCRIPTI
       ONS.":DL=Q:RETURN
GD 775 :
HE 780 GOSUB1595:IFNOTNC=ZTHEN
       PRINTER$(0):RETURN
JF 785 IFNC%(Z)=5THENDN=9:IN=5
       :GOTO615
RD 790 PRINTER$(0):RETURN
SE 795 :
EA 800 FORZ1=1TO7:ONZ1GOSUB850
       ,880,925,905,970,980,94
       0:NEXT:SYSMR:SYSMB:SYSE
       V
CK 805 IFHV>0THENHV=HV-.1
KH 810 IFHV<QTHENHV=Q
SQ 815 NU=NU-(TT-T4)*.06:T4=TT
RD 820 IFNOTICOR(ICANDNOTLN)TH
       ENRETURN
JC 825 POKEXS,CX:POKEYS,CY:POK
       ELS,CL:SYSMV:RETURN
HR 830 IFICTHENRETURN
HF 835 Z2=PEEK(214):PN$=PN$(LO
       ):IFVAL(PN$)THENPN$=PN$
       (VAL(PN$))
RQ 840 Z3=POS(0):GOSUB575:PRIN
       TS8$PN$TAB(33)T1-T;T$
CP 845 POKE214,Z2-1:PRINT:PRIN
       TTAB(Z3)"{B}";:RETURN
BB 850 W1=0:IFTT>1440THENTT=TT
       -1440:T4=T4-1440:T3=T3-
       1440:DY=DY+1:S0=Z:S1=Z:
       S2=Z
AB 855 IFNOTS1ANDTT>1260THENPR
       INT"SUNSET.":S1=Q:NT=Q:
       W1=Q:POKENG,1:GOTO870
BC 860 IFNOTS0ANDTT>1220THENPR
       INT"THE SUN IS SETTING.
       ":S0=Q:W1=Q:GOTO870
DP 865 IFNOTS2ANDTT>300THENPRI
       NT"SUNRISE.":S2=Q:NT=Z:
       W1=Q:POKENG,0
QQ 870 IFW1ANDWTTHENPRINT"KEEP
        WAITING? ";:GOSUB2760:
       WT=NOTLEFT$(IN$,1)="N"
MX 875 RETURN
FK 880 IFRND(1)>.4ORDGTHENDG=Z
       :RETURN
GX 885 D$=PP$(NP%(WF)):I=INT(L
       EN(D$)/6*RND(1))*6+1:E$
       =MID$(D$,I,1)
DJ 890 IFE$="U"ORE$="D"THENRET
       URN
JG 895 D=VAL(MID$(D$,I+2,2)):F
       ORI=0TOWV:IFWV%(I)=DTHE
       NNP%(WF)=D:RETURN
HC 900 NEXT:RETURN
JR 905 IFNOT(VF>0ORNT)THENNP%(
       VR)=67:RETURN
PG 910 VF=VF-1:IFVF>0THENNP%(V
       R)=LO:RETURN
DQ 915 D$=PP$(NP%(VR)):I=INT(L
       EN(D$)/6*RND(1))*6+1:NP
       %(VR)=VAL(MID$(D$,I+2,2
       ))
XS 920 RETURN
XK 925 IFNOTNP%(WF)=LOORRND(1)
       >.6THENRETURN
XQ 930 PRINT"THE WOLVES ARE AT
       TACKING.":IFNOTDFTHENHV
       =HV+2-NU/170:RETURN
RC 935 PRINT"THE DOG DEFENDS Y
       OU.":RETURN
AM 940 IFNOTLNTHENT3=TT:POKESP
       ,Z:RETURN
FE 945 IFNOT(NP%(5)=LOORNP%(5)
       =Q)THENLN=0:RETURN
JA 950 IFICTHENPOKESP,X
HJ 955 AF=INT(AF-(TT-T3)):T3=T
       T:IFAF>60THENRETURN
XS 960 IFAF<0THENLN=Z:AF=Z:POK
       E53269,Z:PRINT"THE LAMP
        IS OUT OF FUEL.":RETUR
       N
FM 965 PRINT"ONLY"AF"MORE MINU
       TES OF LAMP FUEL.":RETU
       RN
DM 970 IFNP%(VR)<>LOORRND(1)>.
       4ORNOTNTTHENRETURN
BM 975 PRINT"THE VAMPIRE IS AT
       TACKING.":HV=HV+3+(NP%(
       15)=QORNP%(11)=Q):RETUR
       N
EP 980 IFNOTICTHENRETURN
XM 985 TX=CX:TY=CY:TL=CL:GOSUB
       2775
JP 990 IFWH=RHTHENPRINT"RATS A
       RE ATTACKING.":HV=HV+.3
       :RETURN
XP 995 IFWH=BHTHENPRINT"BATS A
       RE ATTACKING.":HV=HV+.2
       :RETURN
AX 1000 RETURN
DA 1005 :
DF 1010 IN$=WO$(NW):NW=NW+X:FO
       RI=1TOLEN(DR$)STEP4
EB 1015 IFIN$=MID$(DR$,I,4)THE
       ND$=LEFT$(IN$,X):GOTO1
       025
CX 1020 NEXT:PRINTER$(0):RETUR
       N
QC 1025 IFICTHEN1190
AH 1030 FORI=1TOLEN(PP$(LO))ST
       EP6:IFD$=MID$(PP$(LO),
       I,X)THEN1055
GA 1035 NEXT:IFD$="U"ORD$="D"T
       HENI=X:GOTO1050
SS 1040 FORI=1TOLEN(CD$):IFLEF
       T$(PS$(LO),X)=MID$(CD$
       ,I,X)THEN1050
QX 1045 NEXT:I=X
GC 1050 PRINTCD$(I-X):RETURN
XK 1055 P$=MID$(PP$(LO),I+X,X)
       :IFP$="3"THENPRINT"THE
        WAY IS BLOCKED.":RETU
       RN
AD 1060 IFNOTP$="4"THEN1090
MQ 1065 N=4:GOSUB1645:IFNOTNL=
       QTHEN1075
BX 1070 PRINT"(USING ROPE)":TT
       =TT+5:GOTO1090
AR 1075 IFNL=0THENPRINT"I NEED
        A ROPE.":RETURN
CM 1080 PR=Q:GOSUB1385:GOSUB16
       45:IFNL=QTHEN1070
KC 1085 PRINT"I NEED TO BE CAR
       RYING THE ROPE.":RETUR
       N
BS 1090 T1=VAL(MID$(PP$(LO),I+
       4,2)):L1=VAL(MID$(PP$(
       LO),I+2,2))
XE 1095 TT=TT+T1-T1/3*V+HV*5:H
       V=HV+T1/40*(V+1):IFNOT
       NP%(WF)=LOTHEN1110
MM 1100 FORI=0TOWV:IFWV%(I)=L1
       THENNP%(WF)=L1:GOTO111
       0
MH 1105 NEXT
KS 1110 IFNP%(2)<>LOORNOTDFTHE
       N1120
DR 1115 IFNOT(D$="U"ORD$="D")T
       HENNP%(2)=L1
RH 1120 LO=L1:IFLO=67THEN1150
AC 1125 PN$=PN$(LO):IFVAL(PN$)
       THENPN$=PN$(VAL(PN$))
BQ 1130 PRINT"{DOWN}>"PN$PE$
JQ 1135 IFDLORNOTPV%(LO)THENGO
       SUB1880:GOTO1145
DC 1140 GOSUB1915
KS 1145 PV%(LO)=Q:RETURN
HP 1150 CL=3:CY=30:IFD$="S"THE
       NCY=1
AB 1155 IFD$<>"E"THEN1170
JP 1160 CL=0:CY=15:TL=0:TY=CY:
       FORTX=62TO1STEP-1:GOSU
       B2775:IFWH<>32THENNEXT
       :STOP
EA 1165 GOTO1175
XR 1170 TL=3:TY=CY:FORTX=1TO62
       :GOSUB2775:IFNOTWH=DHT
       HENNEXT:STOP
HQ 1175 CX=TX:IC=Q:PRINT"{CLR}
       ":POKESP,1:POKE53287,P
       EEK(646)
FD 1180 IFNOTLNTHENPRINTER$(4)
KP 1185 GOTO820
EC 1190 D2$=D$:IK=0:MF=1:IFVAL
       (WO$(NW))>0THENMF=VAL(
       WO$(NW)):NW=NW+X
PB 1195 IFNOTLNTHENPRINTER$(4)
XS 1200 IFMF>9THENPRINT"NO MOR
       E THAN NINE TIMES.":RE
       TURN
AK 1205 D$=D2$:GOSUB1220:TT=TT
       +2+HV*2-V:IK=IK+1
EG 1210 IFMF<=IKORMS$=ER$(8)TH
       ENPRINTMS$:GOTO820
AR 1215 GOSUB800:GOTO1205
DD 1220 MS$="":FORI=1TO6:IFNOT
       D$=MID$(D1$,I,1)THENNE
       XT:STOP
BH 1225 GOSUB2775:IFNOTWH=DHTH
       EN1235
JQ 1230 IF(CY=1ANDD$="N")OR(CY
       =30ANDD$="S")THENPRINT
       "{CLR}":IC=Z:POKESP,0:
       GOTO1030
HF 1235 IF(NOTWH=SH)AND(D$="U"
       ORD$="D")THENMS$=ER$(8
       ):RETURN
SX 1240 IF(D$="U"ANDTL=3)OR(D$
       ="D"ANDTL=0)THENMS$=ER
       $(8):RETURN
SP 1245 I=I-1:TX=CX+DD%(0,I):T
       Y=CY+DD%(1,I):TL=CL+DD
       %(2,I):GOSUB2775
RH 1250 IFNOT(WH=THANDRND(1)>.
       2)THEN1265
GQ 1255 PRINT"YOU HAVE FALLEN
       {SPACE}THROUGH A TRAP
       {SPACE}DOOR AND ARE UN
       CONSCIOUS.
GP 1260 IK=MF-1:TM=10+FND(10):
       GOSUB2700:TL=TL-1:GOTO
       1270
JC 1265 IFWH=WCTHENMS$=ER$(8):
       RETURN
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FX 1270 CX=TX:CY=TY:CL=TL:GOSU
        B2775:IFWH=RHTHENMS$="
        THERE ARE RATS HERE."
HQ 1275 IFWH=BHTHENMS$="THERE
        {SPACE}ARE BATS HERE."
CA 1280 RETURN
AD 1285 :
CR 1290 IN$=WO$(NW):IFIN$=PE$T
        HENPRINTER$(0):RETURN
FA 1295 IFIN$="INVE"THENNW=NW+
        X:GOTO1550
QR 1300 GOSUB1715:IFNOTALTHEN1
        345
DC 1305 GOSUB1735:IFNOTBUTHEN1
        315
KC 1310 GOSUB1595:IFNC=QTHENPR
        INTER$(6):RETURN
DA 1315 J=0:FORN=0TONO:IFNOTBU
        THEN1330
AX 1320 FORK=0TONC:IFN=NC%(K)T
        HEN1335
FF 1325 NEXT
SK 1330 GOSUB1645:IFNL=XTHENJ=
        Q:GOSUB1360
DR 1335 NEXTN:IFNOTJTHENPRINT"
        NOTHING TAKEN."
QF 1340 RETURN
KE 1345 GOSUB1595
AB 1350 IFNC=QTHENPRINTER$(0):
        RETURN
HK 1355 FORI=0TONC:N=NC%(I):GO
        SUB1360:NEXT:RETURN
KD 1360 GOSUB1645
KJ 1365 IFNL=QTHENPRINT"YOU AR
        E ALREADY CARRYING THE
        "ND$(N)PE$:RETURN
CX 1370 IFNOTNL=XTHENPRINTER$(
        2)ND$(N)" HERE.":RETUR
        N
JD 1375 IFN=WFTHENPRINT"THE WO
        LVES GROWL.":RETURN
FB 1380 IFNW%(N)=ZTHENPRINTND$
        (N)":ARE YOU KIDDING?"
        :RETURN
FP 1385 IFMW<NW%(N)+PWTHENPRIN
        TND$(N)":I MUST DROP S
        OMETHING FIRST.":RETUR
        N
XM 1390 PW=PW+NW%(N):TT=TT+2
XJ 1395 IFWO=QTHENNP%(N)=Q:GOT
        O1405
DS 1400 MS%(WO)=Q
MH 1405 ND$=ND$(N)+":TAKEN":IF
        PRTHENND$="("+ND$+")":
        PR=0
MR 1410 PRINTND$:RETURN
BM 1415 :
BM 1420 PRINT"QUIT? ";:GOSUB27
        60:IFLEFT$(IN$,1)="Y"T
        HENPRINT"{CLR}{TOP}":E
        ND
PP 1425 RETURN
CM 1430 :
JE 1435 IN$=WO$(NW):IFIN$=PE$T
        HENPRINTER$(0):RETURN
JP 1440 GOSUB1715:IFNOTALTHEN1
        485
RA 1445 GOSUB1735:IFNOTBUTHEN1
        455
GK 1450 GOSUB1595:IFNC=QTHENPR
        INTER$(6):RETURN
MH 1455 J=0:FORN=0TONO:IFNOTBU
        THEN1470
GX 1460 FORK=0TONC:IFNC%(K)=NT
        HEN1475
PX 1465 NEXT
HP 1470 IFNP%(N)=QTHENGOSUB152
        5:J=Q
PF 1475 NEXTN:IFNOTJTHENPRINT"
        YOU LEFT NOTHING."
GX 1480 RETURN
HX 1485 GOSUB1595
KJ 1490 IFNC=QTHENPRINTER$(0):
        RETURN
XP 1495 FORI=0TONC:N=NC%(I):GO
        SUB1500:NEXT:RETURN
PP 1500 GOSUB1645
SD 1505 IFNOTNL=QTHENPRINTER$(
        1)ND$(N)PE$:RETURN
AB 1510 IFNOTICTHEN1525
RQ 1515 PRINTER$(7)ND$(N)".
MP 1520 NL=LO:LO=80:GOSUB1530:
        LO=NL:RETURN
QA 1525 PRINTND$(N)" LEFT."
GH 1530 PW=PW-NW%(N):TT=TT+X
FA 1535 IFWO=QTHENNP%(N)=LO:RE
        TURN
FJ 1540 MS%(WO)=LO:RETURN
XD 1545 :
DB 1550 IFICTHENPRINT"{CLR}":P
        OKESP,0
DH 1555 J=0:FORN=0TONO:GOSUB16
        45
DB 1560 IFNOTNL=QTHEN1575
SQ 1565 IFNOTJTHENJ=Q:PRINT"YO
        U ARE CARRYING:
XH 1570 PRINTND$(N)
MJ 1575 NEXT:IFNOTJTHENPRINT"Y
        OU ARE EMPTY HANDED.
AF 1580 IFICTHENPRINT"{DOWN}PR
        ESS RETURN TO CONTINUE
        : ";:J=USR(0):PRINT"
        {CLR}":POKESP,1
DF 1585 GOTO820
HF 1590 :
SC 1595 NC=Q:FORI=0TOSL:NC%(I)
        =Q:NEXT
QF 1600 IFWO$(NW)=PE$THENRETUR
        N
FB 1605 FORI=0TONO:IN$=NO$(I):
        K=X
AF 1610 IFK>LEN(IN$)THEN1630
SD 1615 FORL=0TOVAL(MID$(IN$,K
        ,X))-X:IFWO$(NW+L)<>MI
        D$(IN$,K+X+L*4,4)THEN1
        625
EC 1620 NEXTL:GOTO1635
RE 1625 K=K+VAL(MID$(IN$,K,X))
        *4+X:GOTO1610
BJ 1630 NEXTI:RETURN
PF 1635 NC=NC+X:NC%(NC)=I:NW=N
        W+L:GOTO1600
MJ 1640 :
KX 1645 WO=Q:NL=0:IF(N=38ORN=3
        9ORN=40)ANDLO=67THENNL
        =X:RETURN
DG 1650 IFSH%(N)=ZTHEN1670
CK 1655 OB=SH%(N)-X:FORWO=1TOL
        EN(SO$(OB))STEP2
DK 1660 IFVAL(MID$(SO$(OB),WO,
        2))=LOTHENNL=X:WO=(WO-
        X)/2:RETURN
SG 1665 NEXT:RETURN
KK 1670 IFN<>19THEN1695
HX 1675 FORWO=0TOMS:IFMS%(WO)=
        QTHENNL=Q:RETURN
BR 1680 NEXT
QK 1685 FORWO=0TOMS:IFMS%(WO)=
        LOTHENNL=X:RETURN
JH 1690 NEXT:RETURN
EP 1695 IFNP%(N)=QTHENNL=Q:RET
        URN
DC 1700 IFNP%(N)=LOTHENNL=X
AR 1705 RETURN
PQ 1710 :
DJ 1715 AL=0:FORI=1TOLEN(AL$)S
        TEP4
CR 1720 IFMID$(AL$,I,4)=WO$(NW
        )THENNW=NW+X:AL=Q:RETU
        RN
QF 1725 NEXT:RETURN
FR 1730 :
HP 1735 BU=0:FORI=1TOLEN(BU$)S
        TEP4
EJ 1740 IFMID$(BU$,I,4)=WO$(NW
        )THENNW=NW+X:BU=Q:RETU
        RN
MP 1745 NEXT:RETURN
XX 1750 :
QQ 1755 TM=Q:IFWO$(NW)="FOR "T
        HENNW=NW+X
QK 1760 IFWO$(NW)="NIGH"THENTM
        =0:NW=NW+X:RETURN
EQ 1765 GOSUB1785:IFNOTT=QTHEN
        TM=TN(T):RETURN
CK 1770 L=VAL(WO$(NW)):IFL=0TH
        ENRETURN
BR 1775 NW=NW+X:GOSUB1785:IFT=
        QTHENT=1
BF 1780 TM=L*TN(T):RETURN
SH 1785 T=Q:FORI=0TOTN:IFTN$(I
        )=WO$(NW)THENNW=NW+X:T
        =I:RETURN
CK 1790 NEXT:RETURN
KE 1795 :
QR 1800 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
FB 1805 GOSUB1595:IFNOTNC=QTHE
        N2045
EF 1810 GOSUB1715:IFALTHEN2000
CC 1815 IN$=WO$(NW):FORI=1TOLE
        N(DR$)STEP4
FD 1820 IFIN$=MID$(DR$,I,4)THE
        NJ=(I-X)/8:D$=MID$(DR$
        ,I,X):GOTO1830
FH 1825 NEXT:GOTO1865
PH 1830 TT=TT+2:NW=NW+X:FORI=1
        TOLEN(PP$(LO))STEP6:IF
        D$=MID$(PP$(LO),I,X)TH
        EN1845
JM 1835 IFICTHENPRINTER$(3):RE
        TURN
FH 1840 NEXT:PRINTER$(3):RETUR
        N
GB 1845 IFNOTMID$(PP$(LO),I+X,
        X)="0"THENPRINT"I CAN'
        T SEE THAT WAY.":RETUR
        N
RJ 1850 PRINT"I SEE THE ";:I=V
        AL(MID$(PP$(LO),I+2,2)
        )
DJ 1855 PN$=PN$(I):IFVAL(PN$)T
        HENPN$=PN$(VAL(PN$))
CD 1860 PRINTPN$PE$:RETURN
QS 1865 IFICTHENPRINT"I AM INS
        IDE THE MEDIEVAL CASTL
        E.":RETURN
JQ 1870 TT=TT+X:PN$=PN$(LO):IF
        VAL(PN$)THENPN$=PN$(VA
        L(PN$))
GD 1875 PRINT"{DOWN}>"PN$PE$
EM 1880 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
XM 1885 J=LO:IFVAL(DE$(PD%(J))
        )THENJ=VAL(DE$(PD%(J))
        )
SR 1890 FORI=PD%(J)TOPD%(J+X)-
        X:PRINTDE$(I)" ";:NEXT
PH 1895 PRINT"{LEFT}."
RP 1900 PRINT"{DOWN}OBVIOUS EX
        ITS TO:":FORI=1TOLEN(P
        P$(LO))STEP6
CB 1905 FORJ=0TODR:IFMID$(PP$(
        LO),I,X)=LEFT$(DR$(J),
        X)THENPRINTDR$(J)" ";
KM 1910 NEXT:NEXT:PRINT
AE 1915 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
CP 1920 J=0:FORN=0TONO
MM 1925 IFN=19AND(MS%(0)=LOORM
        S%(1)=LO)THEN1935
BA 1930 IFNOT(NP%(N)=LOANDNS%(
        N)>Q)THEN1945
SB 1935 IFNOTJTHENPRINT"{DOWN}
        OBJECTS PRESENT:"
DK 1940 PRINTND$(N):J=Q
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RQ 1945 NEXT:FORI=ØTOSO:N=SO%(
        I):GOSUB1645
HP 1950 IFNOT(NL=XANDNS%(N)>Q)
        THENRETURN
JD 1955 IFNOTJTHENPRINT"{DOWN}
        OBJECTS PRESENT:"
BG 1960 J=Q:PRINTND$(N)
HX 1965 RETURN
GR 1970 :
GD 1975 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
MR 1980 GOSUB1715:IFNOTALTHEN2
        040
CR 1985 ND=Q:GOSUB1735:IFNOTBU
        THEN2000
CG 1990 GOSUB1595:IFNC=QTHENPR
        INTER$(6):RETURN
AB 1995 FORI=ØTONC:ND%(I)=NC%(
        I):NEXT:ND=NC
XJ 2000 NC=Q:FORI=ØTOSL:NC%(I)
        =Q:NEXT
XH 2005 FORI=ØTONO:N=I:GOSUB16
        45:IFNL=ØTHEN2030
SC 2010 IFND=QTHEN2025
GK 2015 FORJ=ØTOND:IFI=ND%(J)T
        HEN2030
KS 2020 NEXT
DM 2025 NC=NC+X:NC%(NC)=I
DS 2030 NEXTI:IFNC=QTHENPRINT"
        THERE IS NOTHING TO EX
        AMINE.":RETURN
HF 2035 GOTO2045
KB 2040 GOSUB1595:IFNC=QTHENPR
        INTER$(Ø):RETURN
MQ 2045 FORI=ØTONC:N=NC%(I):GO
        SUB2050:NEXT:RETURN
RS 2050 TT=TT+4:GOSUB1645:IFNL
        =QTHEN2075
PP 2055 IFNOTNL=XTHENPRINTER$(
        2)ND$(N)" HERE.":RETUR
        N
JJ 2060 IFNW%(N)=ØTHEN2075
JE 2065 PR=Q:GOSUB1385:GOSUB16
        45
RG 2070 IFNOTNL=QTHENPRINTER$(
        1)ND$(N)PE$:RETURN
ES 2075 PRINTND$(N)":";:IFN=6T
        HENPRINTNS%(N)"DAY(S)
        {SPACE}OF FOOD LEFT.":
        RETURN
PB 2080 K=N:NN$=NE$(NE%(N)):TT
        =TT+2
EM 2085 IFN=5THEN2100
EC 2087 IFNN$="N"THENPRINTER$(
        3):RETURN
PM 2090 IFVAL(NN$)THENK=VAL(NN
        $)
KC 2095 FORJ=NE%(K)TONE%(K+X)-
        X:PRINTNE$(J)" ";:NEXT
        :PRINT"{LEFT}.{DOWN}":
        RETURN
JB 2100 PRINT"THE LANTERN IS "
        ;
MS 2105 IFLNTHENPRINT"ON.":RET
        URN
MR 2110 PRINT"OFF.{DOWN}":RETU
        RN
PG 2115 :
EK 2120 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
SJ 2125 GOSUB1595:I=Ø:IFNC=QTH
        ENPRINTER$(Ø):RETURN
EQ 2130 N=NC%(I):I=I+X:IFN=QTH
        ENRETURN
DG 2135 IFN=19THENGOSUB2150:GO
        TO2130
FR 2140 IFN=20THENGOSUB2220:GO
        TO2130
KD 2145 PRINTER$(Ø):RETURN
JM 2150 N=17:GOSUB1645:IFNOTNL
        =ØTHEN2165
AP 2155 N=20:GOSUB1645:IFNOTNL
        =ØTHEN2165
PP 2160 PRINT"I NEED LOOSE WOO
        D.":RETURN
RH 2165 KW=N:IFNP%(10)=QORNP%(
        16)=QTHEN2195
QE 2170 N=10:GOSUB1645:IFNL=ØT
        HEN2180
FR 2175 PR=Q:GOSUB1385:GOSUB16
        45:IFNL=QTHEN2195
AG 2180 N=16:GOSUB1645:IFNL=ØT
        HENPRINT"I NEED A TOOL
        .":RETURN
QX 2185 PR=Q:GOSUB1385
RM 2190 IFNOTNP%(N)=QTHENPRINT
        "I NEED A TOOL.":RETUR
        N
AQ 2195 TT=TT+30:PRINT"STAKES
        {SPACE}MADE.":FORJ=ØTO
        MS
RJ 2200 IFMS%(J)=-2THENMS%(J)=
        LO:GOTO2210
JE 2205 NEXT:STOP
SH 2210 N=KW:GOSUB1645:IFNL=QT
        HENPW=PW-NW%(N)
XQ 2215 NP%(N)=-2:RETURN
BC 2220 IFNOTNP%(Ø)=LOTHENPRIN
        T"I NEED A SMALL TREE.
        ":RETURN
BG 2225 N=10:GOSUB1645:IFNL=QT
        HEN2240
RD 2230 IFNL=ØTHENPRINT"I NEED
         AN AXE.":RETURN
KE 2235 PR=Q:GOSUB1385:IFNOTNP
        %(N)=QTHENPRINT"I NEED
         AN AXE.":RETURN
GJ 2240 NP%(Ø)=-2:NP%(21)=LO:T
        T=TT+30:NP%(20)=LO:PRI
        NT"TREE DOWNED.":RETUR
        N
GS 2245 :
KB 2250 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
SB 2255 GOSUB1595:I=Ø:IFNC=QTH
        ENPRINTER$(Ø):RETURN
HF 2260 N=NC%(I):I=I+X:IFN=QTH
        ENRETURN
ME 2265 IFN=ØTHENGOSUB2220:GOT
        O2260
DF 2270 WP=10:GOSUB2350:IFNOTE
        RTHEN2260
XE 2275 PRINTER$(Ø):RETURN
EA 2280 :
JR 2285 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
HM 2290 GOSUB1595:IFNOTNC=ØTHE
        NPRINTER$(Ø):RETURN
QG 2295 VM=NC%(Ø):N=VM:GOSUB16
        45
JR 2300 IFNOTNL=XTHENPRINTER$(
        2)ND$(VM)" HERE.":RETU
        RN
GH 2305 IFNOTWO$(NW)="WITH"THE
        N2330
QM 2310 NW=NW+1:GOSUB1595:IFNO
        TNC=ØTHENPRINT"WITH WH
        AT?":RETURN
JP 2315 WP=NC%(Ø):IFWS%(WP)=ØT
        HENPRINT"THE "ND$(WP)"
         IS NOT A WEAPON.":RET
        URN
MK 2320 IFNP%(WP)=QTHEN2350
JP 2325 PRINTER$(1)ND$(WP)PE$:
        RETURN
HD 2330 WP=Q:FORI=ØTONO:IFNOTN
        P%(I)=QORWS%(I)=ØTHEN2
        340
CR 2335 IFWS%(I)>WPTHENWP=I
EK 2340 NEXT:IFWP=QTHENPRINT"Y
        OU HAVE NO WEAPON.":RE
        TURN
HH 2345 PRINT"(WITH "ND$(WP)")
        "
ED 2350 IFVM=2THENPRINT"THE DO
        G YELPS AND DIES.":DF=
        Ø:ND$(2)="DEAD DOG":RE
        TURN
XH 2355 IFNOTVM=3THEN2375
DB 2360 HV=HV+.2:IFNOTWS%(WP)>
        4THEN2370
XE 2365 PRINT"YOU INJURE ONE W
        OLF; THEY ALL RUN OFF.
        ":GOTO885
JR 2370 PRINTER$(5):RETURN
JG 2375 TL=CL:TX=CX:TY=CY:GOSU
        B2775:IFNOTN=39THEN239
        5
AH 2380 IFNOTWH=BHORNOTICTHENP
        RINT"THERE ARE NO BATS
         HERE.":RETURN
SC 2385 HV=HV+.1:IFWS%(WP)<6TH
        ENPRINTER$(5):RETURN
CM 2390 POKE40960+TX+TY*64+TL*
        2048,Ø:SYSMR:SYSMB:SYS
        EV
QS 2395 IFNOTN=38THENPRINTER$(
        Ø):ER=Q:RETURN
RR 2400 IFNOTWH=RHORNOTICTHENP
        RINT"THERE ARE NO RATS
         HERE.":RETURN
EB 2405 GOTO2385
FH 2410 :
HF 2415 IFNOTLNANDNTTHENPRINTE
        R$(4):RETURN
SS 2420 GOSUB1715:IFALTHENNW=N
        W+X:PRINTER$(Ø):RETURN
PX 2425 GOSUB1595:I=Ø:IFNC=QTH
        ENPRINTER$(Ø):RETURN
RC 2430 N=NC%(I):I=I+X:IFN=QTH
        ENRETURN
MG 2435 IFN=22THENPRINTDN$:GOT
        O2430
EQ 2440 GOSUB1645:IFN=12THENGO
        SUB2465:GOTO2430
MB 2445 IFN=XTHENGOSUB2455:GOT
        O2430
GR 2450 PRINTER$(Ø):RETURN
KH 2455 IFNL=ØTHENPRINTER$(2)"
         SIGN HERE.":RETURN
KE 2460 TT=TT+5:PRINT"THE SIGN
         SAYS:'"RD$(WO)".'":RE
        TURN
MQ 2465 IFNL=ØTHENPRINTER$(2)"
         BOOK HERE.":RETURN
EG 2470 IFNL=XTHENPR=Q:GOSUB13
        85
RD 2475 GOSUB1645:IFNOTNL=QTHE
        NPRINTER$(1)"BOOK.":RE
        TURN
JQ 2480 TT=TT+30:FORJ=BC%(CC)T
        OBC%(CC+X)-X:PRINTBC$(
        J)" ";:NEXT:PRINT"
        {LEFT}."
AX 2485 CC=CC+X:IFCC>MCTHENCC=
        Ø
AQ 2490 RETURN
GX 2495 :
BD 2500 BF=Ø:GOSUB1715:IFNOTAL
        THEN2535
KK 2505 L=Ø:FORI=BFTOFO:N=FO%(
        I):GOSUB1645
CC 2510 IFNL=XORNL=QTHENL=Q:GO
        SUB2550
DB 2515 NEXT:IFLTHEN2530
CR 2520 IFBF=ØTHENPRINT"NOTHIN
        G EDIBLE HERE.":GOTO25
        30
QS 2525 PRINT"NOTHING TO DRINK
         HERE."
CG 2530 TT=TT+2:RETURN
MJ 2535 GOSUB1595:IFNOTNC=QTHE
        N2545
KP 2540 PRINTER$(Ø):RETURN
QE 2545 FORI=ØTONC:N=NC%(I):GO
        SUB2550:NEXT:RETURN
AJ 2550 IFNOTNU>170THEN2565
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JC 2555 IFI<LFTHENPRINT"I'M NO
        T HUNGRY.":RETURN
CX 2560 PRINT"I'M NOT THIRSTY.
        ":RETURN
RA 2565 FORJ=BFTOFO:IFFO%(J)=N
        THEN2580
JH 2570 NEXT:TT=TT+X:IFBF=0THE
        NPRINTND$(N)" NOT EDIB
        LE.":RETURN
MH 2575 PRINT"I CAN'T DRINK TH
        E "ND$(N)PE$:RETURN
MM 2580 IFNS%(N)=0THENPRINT"TH
        ERE'S NONE LEFT.":RETU
        RN
QQ 2585 GOSUB1645:IFNL=XORNL=Q
        THEN2595
QS 2590 PRINTER$(2)ND$(N)" HER
        E.":TT=TT+2:RETURN
RR 2595 IFNL=XTHENPR=Q:GOSUB13
        85
JR 2600 GOSUB1645:IFNOTNL=QTHE
        NPRINTER$(1)ND$(N)PE$:
        RETURN
HQ 2605 PRINTFD$(J)
ER 2610 NU=NU+NU%(J):IFN=6THEN
        2625
ED 2615 NS%(N)=0:PW=PW-NW%(N):
        NW%(N)=NW%(N)/3:PW=PW+
        NW%(N)
RP 2620 ND$(N)="EMPTY "+ND$(N)
        :RETURN
HC 2625 FD=NS%(N)-X:NS%(N)=FD:
        PW=PW-2:NW%(6)=FD*2
MM 2630 IFFD=0THENPRINT"NO MOR
        E FOOD.":NP%(6)=-2
DX 2635 IFFD<3THENPRINT"ONLY";
DB 2640 PRINTFD"DAY(S) OF FOOD
         LEFT.":RETURN
JJ 2645 :
XE 2650 BF=LF:GOSUB1715:IFALTH
        EN2505
SS 2655 GOTO2535
PJ 2660 :
BQ 2665 GOSUB1755:FORK=0TOSE:I
        FSE%(K)=LOTHEN2675
JD 2670 NEXT:PRINT"I CAN NOT S
        LEEP HERE.":RETURN
BB 2675 IFNOT(TM=0ORTM=Q)THEN2
        695
FA 2680 PRINT"SLEEP FOR TEN HO
        URS? ";:GOSUB2760:IFNO
        TLEFT$(IN$,X)="Y"THENR
        ETURN
GB 2685 FORK=1TO30:HV=HV-.13:T
        T=TT+20:GOSUB800:GOSUB
        830:NEXT
XP 2690 RETURN
MD 2695 IFTM>600THENPRINT"I CA
        N SLEEP ONLY FOR TEN H
        OURS AT A TIME.":TM=60
        0
KQ 2700 FORK=0TOTMSTEP20:TT=TT
        +20:HV=HV-.13:GOSUB800
        :GOSUB830:NEXT
FP 2705 RETURN
GM 2710 :
EC 2715 GOSUB1755:IFTM=0ORTM=Q
        THENTM=10
QC 2720 IFNOTTM>59THEN2740
BS 2725 PRINT"REALLY WAIT THAT
         LONG? ";:GOSUB2760
BH 2730 IFLEFT$(IN$,X)<>"Y"THE
        NRETURN
QK 2735 WT=Q:FORK=0TOTMSTEP5:H
        V=HV-.017:TT=TT+5:GOSU
        B800:IFWTTHENNEXT:WT=0
AR 2740 RETURN
GS 2745 :
BG 2750 PRINT"I CAN OFFER NO H
        ELP.":RETURN
FX 2755 :
RR 2760 GOSUB830:ZL=USR(0)-1:P
        RINT:IN$="":IFZL=QTHEN
        RETURN
RA 2765 FORI=0TOZL:IN$=IN$+CHR
        $(PEEK(BP+I)):NEXT:VI=
        VAL(IN$):RETURN
EX 2770 :
EM 2775 POKEXS,TX:POKEYS,TY:PO
        KELS,TL:SYSWK:WH=PEEK(
        OS):RETURN
JA 2780 :
CC 2785 DATA,50,21,1,-1,1,,3,.
JB 2790 DATAAND INTOEMPTA
        {3 SPACES}AN{2 SPACES}
        THE TO{2 SPACES}AT
        {2 SPACES}SOME
RQ 2795 DATANORTN{3 SPACES}SOU
        TS{3 SPACES}EASTE
        {3 SPACES}WESTW
        {3 SPACES}UP{2 SPACES}
        U{3 SPACES}DOWND
        {3 SPACES},NSEWUD
CG 2800 DATA "VAMPYRE HUNTER"
FH 2805 DATA5,2, 30,40,14,4,3,
        92,3,3,8,58,128,17,4,5
        ,6,ALL EVER
GF 2810 DATAEXCEBUT ,NWTB,1,11
        00,820,821,822,2,18,4,
        3,20,831,19,160,40,600
KF 2815 DATA1020,80,22,5,,,1,-
        1,,,-1,1,,,,,,,,1,-1
BM 2820 DATA"I CAN'T GO THAT W
        AY.
MB 2825 DATA"THE WAY IS BLOCKE
        D BY WATER.
MH 2830 DATA"THE TREES ARE TOO
         DENSE IN THAT DIRECTI
        ON.
JJ 2835 DATA"THERE'S A WALL TH
        ERE.
MB 2840 DATANORTH,SOUTH,EAST,W
        EST,UP,DOWN
CE 2845 DATAHOUR,60,MINU,1,SEC
        O,.017
RM 2850 DATAGO{2 SPACES}WALKCL
        IM,RUN ,TAKEGET GRAB,Q
        UITEND ,DROPLEAV,I
        {3 SPACES}INVE,L
        {3 SPACES}LOOK
MX 2855 DATAREAD,HELP,EXAM,MAK
        EBUIL,AXE CHOP,EAT ,DR
        IN,SLEE,WAITREST,JUMP
EE 2860 DATASCREYELLSHOU,BRIE,
        VERB,HI{2 SPACES}HELL,
        KILLATTAFIGHSTAB,TIME,
        GIVEFEEDTHRO
BK 2865 DATACOLO,LAMP,LIGHIGNI
        ,EXTISMUT,DRIV,REFU,CL
        EA
PD 2870 DATA1TREE2SMALTREE,21,
        ,SMALL TREE,,1SIGN,-2,
        ,SIGN,
RR 2875 DATA1DOG 2DEADDOG ,60,
        ,DOG,,1WOLF1WOLV,85,,W
        OLVES,,1ROPE,23,5,ROPE
AQ 2880 DATA1LAMP1LANT,5,5,LAN
        TERN,,1FOOD,3,,FOOD,10
        ,2VINEBOTT1VINE3BOTTOF
        {2 SPACES}VINE
EE 2885 DATA5,1,BOTTLE OF VINE
        GAR,1,1MALL2WOODMALL,5
        ,2,WOODEN MALLET,
SS 2890 DATA1FUEL1OIL 2LANTFUE
        L,23,1,LANTERN FUEL,,1
        AXE ,29,10,AXE,
EF 2895 DATA1GARL3STRIOF
        {2 SPACES}GARL,22,1,ST
        RING OF GARLIC,,1BOOK,
        30,2,BOOK,
JG 2900 DATA2WATEBOTT1WATE2HOL
        YWATE4BOTTOF{2 SPACES}
        HOLYWATE3BOTTOF
        {2 SPACES}WATE,19,2
QQ 2905 DATABOTTLE OF HOLY WAT
        ER,1,1WAFE2HOLYWAFE4TI
        N OF{2 SPACES}HOLYWAFE
        3TINOF{2 SPACES}WAFE
MR 2910 DATA19,2,TIN OF HOLY W
        AFERS,1,1CRUC,18,2,CRU
        CIFIX,
XP 2915 DATA1KNIF3SHORBLADKNIF
        ,49,1,KNIFE,,1PALE2FEN
        CEPALE,48,10
XP 2920 DATABROKEN FENCE PALES
        ,,1MIRR3PIECEOF
        {2 SPACES}MIRR,24,1,PI
        ECE OF MIRROR,
BG 2925 DATA1STAK2WOODSTAK,-2,
        2,WOODEN STAKES,,1LOGS
        1LOG 1WOOD,-2,,LOGS,
QF 2930 DATA1STUM,-2,,STUMP,,2
        CORNSTON1STON,64,,CORN
        ER STONE,,1WELL,-2,,WE
        LL,-1
GQ 2935 DATA1CHUR,-2,,CHURCH,-
        1,1INN ,-2,,VILLAGE IN
        N,-1,1SHOP,-2,,VILLAGE
         SHOP,-1
JE 2940 DATA1HOUS,-2,,HOUSE,-1
        ,1COTT,-2,,COTTAGE,-1,
        1GATE2IRONGATE,-2,,IRO
        N GATE
CS 2945 DATA-1,2GATEHOUS,-2,,G
        ATE HOUSE,-1,1RIVE,-2,
        ,RIVER,-1,1SWAM,-2,,SW
        AMP,-1
SG 2950 DATA1FIEL,-2,,FIELD,-1
        ,1CAST,-2,,CASTLE,-1,1
        GARD,-2,,GARDEN,-1,1VI
        LL,,
RK 2955 DATAVILLAGE,-1,1WALL,-
        2,,STONE WALL,-1,1RAT
        {SPACE}1RATS,-2,,RATS,
PM 2960 DATA1BAT 1BATS,-2,,BAT
        S,,1VAMP,67,,VAMPIRE,
XK 2965 DATA1,01163908,23,5813
        ,24,1617,25,0102,26,08
        09,27,27283132123946478
MS 2970 DATA28,272831321239464
        748,29,41519280,30,514
        19280,31,3775,32,37707
        17535
AG 2975 DATA33,726973687170,34
        ,41925180,35,616058836
        664,37,6564668382
KX 2980 DATA6,100,11,20,14,15,
        7,5,13,5
SA 2985 DATA"THAT REALLY HITS
        {SPACE}THE SPOT.","RAW
         GARLIC, YUCK!
EM 2990 DATA"WHY DID I EAT THE
         HOLY WAFERS?","YICK!"
        ,"THANKS, I WAS THIRST
        Y.
QH 2995 DATA"PATH APPROACHING
        {SPACE}VILLAGE",N00110
        ,T,"PATH IN FRONT OF I
        NN
GA 3000 DATAN00710E00203S00010
        ,T,"WALKWAY TO INN",E0
        0303W00103,T
XE 3005 DATA"INN DINING ROOM",
        E20503W20206U20405,B,B
        EDROOM,D20305,B
QD 3010 DATABACKROOM,W20306,B,
        PATH,N01505E00705,T,6,
        E00810W00605S00110,T
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DX 3015 DATA"PATH IN FRONT OF {SPACE}SHOP",N00903E01020W00710,T,"WALKWAY TO SHOP"
GM 3020 DATAN02303S00803,T,6,N01105W00820,T,6,N02710S01005E01206,T
CS 3025 DATA"PATH IN FRONT OF {SPACE}HOUSES",E01312W01106,T,WELL,W01212D41415,T
GJ 3030 DATAINSIDE THE WELL,U41320,N,6,N01610S00605,T
XS 3035 DATA"PATH IN FRONT OF {SPACE}CHURCH",N02010S01510E02515W01703,T
CX 3040 DATA"WALKWAY TO CHURCH",E01603W01803,T,"CHURCH SANCTUARY
AB 3045 DATAE21703S21910,B,"CHURCH ALCOVE",N21810,B,6,N04010S01610E02105,T
EK 3050 DATA6,W02030E03405,T,ROOT CELLER,U22305,B,SHOP,S20903U22405D22205,B
PK 3055 DATABEDROOM OF SHOP,D22305,B,6,N03420E02613W01615,T,6,N03320E02707W02513,T
EA 3060 DATA6,N03210S01110W02607E02804,T,WALKWAY TO {SPACE}HOUSE,E02904W02704,T
PQ 3065 DATADESERTED HOUSE,W22804,B,29,W23104,B,28,W03204E03004,T
SG 3070 DATA6,N04310S02710E03104W03314,T,FOREST,N24220S22620E23214W23426,T
MK 3075 DATA33,N24120S22520E23326W22130,T,RIVER BANK,N27440E23720,W,SWAMP,N23720,W
CX 3080 DATABROKEN BRIDGE,N07340S03620E03805W03520,W,6,E03910W03705,T
AD 3085 DATA6,E04010W03810N04704,T,6,E04115W03910S02010,T,6
CA 3090 DATAE04213W04015N05104S03420,T,6,S03320E04307W04113,T,6
XC 3095 DATAN05310S03210E04410W04207,T,6,E04510W04310,T,6,W04410,T,FENCE,E04704,T
GE 3100 DATAWALKWAY TO GROUNDSKEEPER'S HOUSE,N04904S03904E04804W04604,T,46
PE 3105 DATAW04704,T,GROUNDSKEEPER'S HOUSE,N26820S24704,B,WEST GATE HOUSE,E25104,B
AH 3110 DATASOUTH GATE,N06705S04104E05204W05004,N,EAST GATE HOUSE,W25104N26503,B
SX 3115 DATA6,N06115S04310W06308E05420,N,GARDEN,N26030W25320E25520,T,54
FB 3120 DATAN25830E25620W25420,T,54,W25520N25930,T,14,U45820W26710,N
JB 3125 DATA13,N08730S05530E05920W06010D45715,N,54,N28830S25630W25820,T
FK 3130 DATA6,N08630S05430E05810W06110,N,6,N08515S05315E06010W06208,N
AG 3135 DATA54,N28430S26330E26108W26606,N,54,N26230W26406E25308,T,WALL
CK 3140 DATAN26630E26306W26520,T,64,E26420S25206,N,64,N28330S26430E26206,N
FE 3145 DATACASTLE,N28005S25105,B,SOUTH FIELD,N06915S04920W07006,N,NORTH FIELD
XR 3150 DATAN07710S06815W07106,N,SMALL DIKE,N27130E26806W27312,W
CP 3155 DATA70,S27030E26906W27212,W,36,N27520S27330E27110W27430,W,36
QC 3160 DATAN27230S23740E27010W27420,W,36,N27215S23540E27320,W,35
BJ 3165 DATAN27610S27220E27715,W,RIVER,S27510,W,6,E07815S06910W07515,T,6
KK 3170 DATAW07715E09215,T,50,E08004,B,NORTH GATE,N09204S06705E08104W07904,N,52
AE 3175 DATAW08004S08206,B,64,N28106E28320,N,64,S26630E28412W28220,N,54
KK 3180 DATAS26230W28306E28508,T,6,N08915S06115E08620W08412,N,54
KX 3185 DATAS26030E28720W28520,T,54,S25830W28620E28820,T,54,W28730S25920,T
RA 3190 DATA6,N09010W09107S08515,T,6,S08910,T,6,E08907W09213,T
AD 3195 DATA6,E09113W07815S08004,T
AB 3200 DATA"INN","THE VILLAGE CHURCH","GROUNDSKEEPER","SHOP AND TRADING POST
KK 3205 DATA"'SLAYING VAMPIRES' (READ MORE)",
CQ 3210 DATA"PART ONE:AN UNINTERESTING HISTORY OF VAMPIRES",
RK 3215 DATA"PART TWO:THE VAMPIRE FEARS MIRRORS, BECAUSE HE DOES NOT CAST
BQ 3220 DATA"REFLECTIONS AND CAN BE IDENTIFIED. HOLY WATER BURNS HIS SKIN {SPACE}AND
CP 3225 DATA"HE FEARS THE CRUCIFIX. GARLIC IS ALSO A GOOD DEFENSE.
AC 3230 DATA"HE CAN CALL BATS, RATS AND WOLVES TO HIS DEFENSE.",
RQ 3235 DATA"PART THREE:THE VAMPIRE CAN BE KILLED IN ONE OF TWO WAYS:
RG 3240 DATABY DRIVING A WOODEN STAKE INTO HIS BODY {SPACE}OR BY KEEPING HIM
FF 3245 DATAOUT OF HIS CASKET {SPACE}UNTIL DAWN.
HG 3250 DATAN,,AN OLD WOODEN SIGN WITH WORDS ENGRAVED ON IT,,N,
JE 3255 DATA"THIS PACK OF VICIOUS WOLVES SEEMS TO BE EYEING ME HUNGRILY",
FM 3260 DATA"A GOOD LENGTH OF {SPACE}STURDY HEMP ROPE STRONG ENOUGH TO SUPPORT
JH 3265 DATATHE WEIGHT OF A HUMAN,,N,,N,
PP 3270 DATA"THIS ANCIENT BOTTLE OF VINEGAR IS ALMOST FULL",,N,,N,,N,
KX 3275 DATA"A LONG STRING OF {SPACE}POTENT SMELLING GARLIC",
XK 3280 DATA"THIS DUSTY OLD BOOK MAY BE WORTH READING",,N,,N,,N,
SA 3285 DATA"A SHORT-BLADED WOOD HANDLED KNIFE WHICH LOOKS SOMETHING LIKE {SPACE}A
EJ 3290 DATA"DAGGER. IT SEEMS {SPACE}TO HAVE BEEN USED FOR MANY THINGS, BUT IT IS STILL
GA 3295 DATA"IN VERY GOOD CONDITION DESPITE ITS AGE",,N,,N,
BQ 3300 DATA"THESE STAKES ARE {SPACE}CARVED WITH ONE SHARP END",
DX 3305 DATA"A SHORT LOG FROM {SPACE}A RECENTLY DOWNED ELM TREE",,N,
GF 3310 DATA"THIS CORNER STONE HAS A SHORT DEDICATION ENGRAVED ON IT",
AM 3315 DATA"THE WELL IS CIRCULAR WITH AN OPENING LARGE ENOUGH FOR A MAN
KB 3320 DATA"TO CLIMB DOWN. THERE IS A STRONG POST TO TIE A ROPE TO NEARBY"
FQ 3325 DATA"THE CHURCH IS A STONE BUILDING IN GOOD {SPACE}CONDITION FOR ITS AGE",
HF 3330 DATA"THE VILLAGE INN IS A DECAYING TWO STORY WOODEN BUILDING. IT APPEARS
DX 3335 DATA"TO BE THE ONLY INN IN THE VILLAGE",
DE 3340 DATA"THE VILLAGE SHOP {SPACE}LOOKS RECENTLY {SPACE}ABANDONED. IT IS WELL MAINTAINED,
XA 3345 DATA"BUT IS BEGINNING {SPACE}TO SHOW ITS AGE"
HQ 3350 DATA"THIS HOUSE, LIKE {SPACE}MANY OF THE OTHERS IN THE VILLAGE, IS OLD, AND
PJ 3355 DATA"VERY SMALL. IT HAS ONLY ONE STORY AND A SINGLE ROOM",,27,
SP 3360 DATA"THIS LARGE IRON GATE TO THE CASTLE IS RUSTED AND WILL NOT MOVE.
GQ 3365 DATA"FORTUNATELY, IT HAS BEEN LEFT OPEN FOR {SPACE}ANY WANDERING TRAVELER",
DB 3370 DATA"THIS STONE GATE HOUSE HOLDS ONE SIDE OF THE IRON GATE",
DH 3375 DATA"THE RIVER FLOWS STEADILY AND IS FAIRLY {SPACE}DEEP",
RE 3380 DATA"THE SWAMP IS NOT {SPACE}TOO DANGEROUS, {SPACE}BUT IT IS DIFFICULT TO TRAVEL
```

```
RS 3385 DATA"THROUGH IT. DIREC
        TIONS TEND TO GET CONF
        USED IN THE SWAMP",
SE 3390 DATA"THIS FIELD WAS ON
        CE USED EXTENSIVELY FO
        R FARMING, BUT NO LONG
        ER. IT
SD 3395 DATAHAS NOT BEEN PLOUG
        HED FOR MANY YEARS,
HC 3400 DATA"THIS CASTLE COMES
         COMPLETE WITH A MOAT
        {SPACE}AND DRAWBRIDGE.
         THE BRIDGE
ER 3405 DATA"IS DOWN AND SAFE
        {SPACE}FOR TRAVEL. THE
         OUTER WALL IS MADE OF
         STONE, BUT
CH 3410 DATA"THERE IS ONLY ONE
         ROW OF SMALL WINDOWS.
         THE GATE SEEMS TO BE
        {SPACE}THE
BJ 3415 DATA"ONLY WAY INTO THE
         CASTLE",
GB 3420 DATA"THIS WAS ONCE A L
        OVELY GARDEN, BUT THOU
        GH YEARS OF NEGLECT HA
        S
FQ 3425 DATAREVERTED TO FOREST
         LAND,
BB 3430 DATA"THE SMALL VILLAGE
         THAT LIES TO THE NORT
        H PROBABLY HAS A SMALL
         INN,
SH 3435 DATA"SHOP AND CHURCH.
        {SPACE}THERE ARE SOME
        {SPACE}HOUSES. I DO NO
        T SEE MANY PEOPLE
GG 3440 DATA"ABOUT AND THEY AR
        E ALL VERY SHY. DON'T
        {SPACE}EXPECT ANY CONV
        ERSATIONS",
EK 3445 DATA"THE STONE WALLS A
        RE MADE UP OF MANY IRR
        EGULARLY SHAPED STONES
        , HELD
QD 3450 DATA"TOGETHER WITH MOR
        TAR. THERE ARE NO GAPS
         BETWEEN THE
SD 3455 DATA"STONES. ODDLY, TH
        ERE IS ONLY ONE ROW OF
         WINDOWS ON THE WALL",
HR 3460 DATA"A BITE FROM ONE O
        F THESE LARGE RATS MIG
        HT PROVE FATAL",
CQ 3465 DATA"THESE ARE LARGE V
        AMPIRE BATS. THEIR BIT
        E IS INCAPACITATING",
PD 3470 DATA"THE VAMPIRE HAS A
         LONG BLACK CAPE AND S
        HARP FANGS
JG 3475 DATA"A SMALL VILLAGE L
        IES TO THE NORTH",
FJ 3480 DATA"THE WALK TO AN IN
        N LIES TO THE EAST OF
        {SPACE}THIS NORTH-SOUT
        H PATH",
ED 3485 DATA"YOU ARE ON THE CO
        BBLE STONE WALK OF THE
         INN",
KC 3490 DATA"THE DINING HALL O
        F THE INN IS POORLY LI
        T. IT AND A SMALL BACK
         ROOM
CE 3495 DATA"OCCUPY THE ENTIRE
         DOWNSTAIRS OF THE CRU
        MBLING
CJ 3500 DATA"BUILDING. A STAIR
        WAY LEADS UP TO A VACA
        NT BEDROOM",
DA 3505 DATA"THIS SMALL BEDROO
        M HAS SEEN MANY TRAVEL
        ERS. THERE IS A SMALL
        {SPACE}BED
KA 3510 DATA"WHERE YOU CAN SLE
        EP COMFORTABLY. SOME I
        TEMS LEFT BY OTHERS
RA 3515 DATA"ADORN THE ROOM, B
        UT THERE IS NOTHING US
        EFUL",
KH 3520 DATA"THE BACKROOM OF T
        HE INN IS USED TO STOR
        E UNUSED ITEMS",
DH 3525 DATA"THE PATH TURNS HE
        RE AND HEADS NORTH AND
         EAST",
AR 3530 DATA"THIS EAST-WEST PA
        TH CUTS THOUGH THE VIL
        LAGE",
MF 3535 DATA"THE WALK TO THE V
        ILLAGE SHOP LIES NORTH
         OF HERE",
QP 3540 DATA"A DESERTED SHOP L
        IES TO THE NORTH. IT I
        S OLD, BUT ONE OF THE
CH 3545 DATA"BETTER KEPT BUILD
        INGS IN THE VILLAGE",
FF 3550 DATA"THE PATH TURNS HE
        RE AND CONTINUES NORTH
         AND WEST",
KH 3555 DATA"THE PATH IS NORTH
        -SOUTH. TO THE EAST AR
        E SOME OCCUPIED COTTAG
        ES",
QD 3560 DATA"SOME OCCUPIED HOU
        SES ARE SOUTH OF THIS
        {SPACE}PATH",
RA 3565 DATA"THE PATH ENDS AT
        {SPACE}A DRY WELL",
AJ 3570 DATA"THERE IS NO WAY O
        UT BUT UP",
AS 3575 DATA"THERE IS A SIGN T
        O THE NORTH WHICH IS T
        OO SMALL
CE 3580 DATATO BE READ FROM TH
        IS DISTANCE,
HG 3585 DATA"TO THE WEST LIES
        {SPACE}THE WALK TO THE
         ONLY CHURCH IN THE VI
        LLAGE",
PJ 3590 DATA"THE VILLAGE CHURC
        H LIES FURTHER TO THE
        {SPACE}WEST",
AB 3595 DATA"THIS PART OF THE
        {SPACE}CHURCH IS WELL
        {SPACE}MAINTAINED, BUT
         LOOKS AS IF IT HAD
QK 3600 DATA"BEEN DAMAGED RECE
        NTLY",
FF 3605 DATA"THIS ROOM IS SMAL
        LER THAN THE ROOM TO T
        HE NORTH. THERE ARE
RP 3610 DATA"SOME USEFUL THING
        S HERE",
BP 3615 DATA"THE ROAD DIVIDES
        {SPACE}TO THE NORTH. T
        HERE IS A SIGN AND A S
        MALL BUILDING
SQ 3620 DATA"TO THE SOUTH",
FC 3625 DATA"THE PATH BECOMES
        {SPACE}MORE LIKE A TRA
        IL AS IT HEADS EAST IN
        TO THE FOREST",
QR 3630 DATA"IT IS COOL AND DR
        Y HERE. THERE ARE EMPT
        Y BASKETS ON THE SHELV
        ES
DC 3635 DATA"WHICH LINE THE WA
        LLS OF THIS ROOM",
GC 3640 DATA"THE GROUND FLOOR
        {SPACE}OF THE SHOP LOO
        KS RECENTLY ABANDONED.
         THERE ARE
PH 3645 DATA"STILL SOME SUPPLI
        ES, BUT MOST ARE SCATT
        ERED USELESSLY ABOUT.
CM 3650 DATA"STAIRWAYS LEAD UP
         AND DOWN FROM HERE",
KQ 3655 DATA"THIS APPEARS TO H
        AVE BEEN THE BEDROOM O
        F THE SHOPKEEPER, ALTH
        OUGH
SM 3660 DATA"THERE ARE NO LONG
        ER ANY SIGNS OF THE PE
        RSON WHO ONCE LIVED HE
        RE",
KX 3665 DATA"TO THE SOUTH THER
        E IS THE REAR OF A TWO
         STORY BUILDING,
DS 3670 DATA"BUT THERE IS NO W
        AY THERE FROM HERE",
EJ 3675 DATA"FAR TO THE EAST A
        RE SOME DESERTED HOUSE
        S",
GD 3680 DATA"THIS IS PART OF A
         LONG NORTH-SOUTH PASS
        AGE THROUGH A THICK FO
        REST",
FB 3685 DATA"A DESERTED HOUSE
        {SPACE}LIES TO THE EAS
        T. TO THE NORTH, THROU
        GH SOME TREES,
BP 3690 DATA"IS ANOTHER DESERT
        ED HOUSE",
XJ 3695 DATA"THIS IS THE INSID
        E OF A SMALL, ONE ROOM
         COTTAGE. NOT MUCH REM
        AINS
PA 3700 DATA"OF THE BUILDING A
        ND ITS LAST OCCUPANTS,
         BUT THERE ARE MAY BE
KQ 3705 DATASOME USEFUL THINGS
         HERE,,29,
DR 3710 DATA"A DESERTED HOUSE
        {SPACE}LIES TO THE EAS
        T. TO THE SOUTH, BEYON
        D SOME TREES
PR 3715 DATALIES ANOTHER HOUSE
        ,,27,
JP 3720 DATA"THE FOREST HERE I
        S VERY DENSE; LITTLE C
        AN BE SEEN IN ANY DIRE
        CTION",
FH 3725 DATA33,,"THE RIVER HER
        E FLOWS STEADILY",
PP 3730 DATA"THIS IS THE SOUTH
         END OF THE SWAMP",
AQ 3735 DATA"THIS BRIDGE ONCE
        {SPACE}SPANNED THE WID
        TH OF THE RIVER",
FE 3740 DATA"THERE IS A SIGN T
        O THE EAST WHICH IS TO
        O SMALL TO BE READ FRO
        M HERE",
RE 3745 DATA"TO THE NORTH IS T
        HE GROUNDSKEEPER'S SMA
        LL COTTAGE",
JF 3750 DATA"THE PATH TURNS HE
        RE HEADING NORTH AND E
        AST. A SMALLER PATH, L
        ESS
MJ 3755 DATA"RECENTLY USED, HE
        ADS WEST. TO THE NORTH
         IS THE MOAT OF
MR 3760 DATATHE OLD MEDIEVAL C
        ASTLE,
ER 3765 DATA"TO THE NORTH IS T
        HE GATE OF THE OLD MED
        IEVAL CASTLE. THE PATH
CK 3770 DATACONTINUES EAST-WES
        T,
CK 3775 DATA"THE PATH CONTINUE
        S EAST-WEST. TO THE NO
        RTH IS THE MOAT OF THE
```

```
RX 3780 DATAOLD MEDIEVAL CASTL
        E,
AJ 3785 DATA"TWO PATHS CROSS H
        ERE, ONE EAST-WEST, TH
        E OTHER NORTH-SOUTH.
EK 3790 DATA"BOTH WERE ONCE US
        ED HEAVILY",
CD 3795 DATA"THIS EAST-WEST PA
        TH LEADS DEEPER INTO T
        HE FOREST",
JC 3800 DATA"FURTHER TRAVEL EA
        ST IS BLOCKED BY FALLE
        N TREES",
XC 3805 DATA"THERE WAS ONCE A
        {SPACE}PICKET FENCE HE
        RE, BUT VERY LITTLE RE
        MAINS",
XJ 3810 DATA"THE COBBLE STONE
        {SPACE}WALK TO THE GRO
        UNDSKEEPER'S COTTAGE
EC 3815 DATA"LOOKS LIKE IT WAS
         ONCE WELL MAINTAINED.
         NOW IT IS VERY MUCH
DP 3820 DATAOVERGROWN,,46,
FG 3825 DATA"THERE ARE FEW PER
        SONAL ITEMS HERE, BUT
        {SPACE}SOME THINGS MAY
         BE USEFUL",
PD 3830 DATA"THIS IS ONE OF TW
        O GATE HOUSES FOR THE
        {SPACE}SOUTH-GATE OF T
        HE CASTLE",
DQ 3835 DATA"THE LARGE IRON GA
        TE HAS BEEN LEFT OPEN;
         THE DRAWBRIDGE OVER T
        HE MOAT
SS 3840 DATA"HAS BEEN LEFT DOW
        N. ENTERING THE CASTLE
         HERE WILL PUT YOU ON
        {SPACE}THE"
EJ 3845 DATA"GROUND FLOOR OF T
        HE CASTLE. THERE DO NO
        T APPEAR TO BE ANY OTH
        ER
KQ 3850 DATAENTRANCES ON THIS
        {SPACE}FACE OF THE CAS
        TLE,,50,
EB 3855 DATA"THIS NORTH-SOUTH
        {SPACE}PATH CUTS THROU
        GH AN OVERGROWN GARDEN
        ",,86,,86,,86,
KH 3860 DATA"THERE IS ABOUT A
        {SPACE}FOOT OF WATER H
        ERE. STRANGE, THERE IS
         A SLIGHT
XP 3865 DATADRAFT COMING FROM
        {SPACE}THE WEST,
FM 3870 DATA"THIS CIRCULAR PAT
        H AROUND THE WELL SEEM
        S RARELY USED",,86,
DR 3875 DATA"THIS EAST-WEST PA
        TH CUTS THROUGH AN OVE
        RGROWN GARDEN",
BC 3880 DATA"THE PATH CONTINUE
        S NORTH-SOUTH; THERE I
        S A NEW PATH HEADING E
        AST",
JJ 3885 DATA"THIS PART OF THE
        {SPACE}GARDEN LIES BET
        WEEN A NORTH-SOUTH PAT
        H AND
AJ 3890 DATATHE EAST CASTLE WA
        LL,,62,
ER 3895 DATA"THIS IS THE SOUTH
        -EAST CORNER OF THE ST
        ONE WALL OF THE CASTLE
        ",
FP 3900 DATA"THE ONLY ACCESIBL
        E PORTION OF THE SOUTH
         WALL OF THE CASTLE",
AB 3905 DATA"THIS IS THE EAST
        {SPACE}WALL OF THE CAS
        TLE. THERE ARE NO ENTR
        ANCES HERE",
DA 3910 DATA" ",,"THIS LARGE F
        IELD WAS ONCE USED EXT
        ENSIVELY FOR FARMING",
        ,68,
HA 3915 DATA"A SMALL DIKE WAS
        {SPACE}CONSTRUCTED HER
        E TO KEEP THE RIVER FR
        OM FLOODING
XA 3920 DATATHE FIELDS DURING
        {SPACE}THE SPRING RUNO
        FF,,70,
SF 3925 DATA"THE EAST END OF T
        HE SWAMP. DIRECTIONS G
        ET CONFUSED HERE",,72,
HH 3930 DATA"THE WEST END OF T
        HE SWAMP. THERE IS A R
        IVER NEARBY",,35,
SJ 3935 DATA"THE CURRENT IS ST
        RONG, BUT NOT SO STRON
        G THAT I CAN'T KEEP MY
FK 3940 DATAFOOTING,,"THE EAST
        -WEST PATH ENDS HERE A
        ND OPENS INTO A LARGE
        {SPACE}FIELD
HM 3945 DATATO THE SOUTH,,"THE
         PATH IS EAST-WEST FRO
        M HERE",
QP 3950 DATA"ONE OF THE TWO GA
        TE HOUSES FOR THE NORT
        H GATE OF THE CASTLE",
ES 3955 DATA"THERE IS A SMALL
        {SPACE}IRON GATE HERE.
         THIS MAY HAVE BEEN SO
        ME KIND OF
DX 3960 DATA"SERVICE ENTRANCE.
         THE GATE HAS BEEN LEF
        T OPEN, AND THE DRAWBR
        IDGE
KP 3965 DATADOWN OVER THE MOAT
        ,,79,
AH 3970 DATA"THE ONLY ACCESSIB
        LE PORTION OF THE NORT
        H WALL OF THE CASTLE",
MB 3975 DATA"THE NORTH WEST CO
        RNER OF THE CASTLE WAL
        L",,62,,53,
QE 3980 DATA"THIS IS ONLY ONE
        {SPACE}PART OF AN OVER
        GROWN GARDEN",,86,,86,
KH 3985 DATA"A NEW PATH HEADS
        {SPACE}WEST, WHILE THI
        S PATH CONTINUES NORTH
        ",
JE 3990 DATA"FURTHER TRAVEL NO
        RTH IS BLOCK BY FALLEN
         TREES",
XB 3995 DATA"PART OF A LONG EA
        ST-WEST PATH",,"TO THE
         SOUTH IS THE NORTH GA
        TE
SS 4000 DATA"OF A MEDIEVAL STY
        LE CASTLE. THE EAST-WE
        ST PATH CONTINUES
PS 4005 DATA83,84,85,86,87,88,
        66,62,64,60,58,59,64,6
        3,53,54,55,56
RP 4010 DATA2,3,38,39,40, 7,11
        ,13,14,15,18
PG 4015 DATA4,2,5,1,8,3,10,7,1
        6,6,17,4,19,5
DE 4020 DATA"BORDER COLOR? ",5
        3280,"SCREEN COLOR? ",
        53281,"CHARACTER COLOR
        ? ",646
HR 4025 DATA"I DO NOT UNDERSTA
        ND.","I AM NOT CARRYIN
        G THE ","I DO NOT SEE
        {SPACE}THE "
QP 4030 DATA"I SEE NOTHING SPE
        CIAL.","IT IS TOO DARK
         TO SEE.","NOTHING HAP
        PENS."
MQ 4035 DATA"EVERYTHING EXCEPT
         WHAT?","A LARGE BAT C
        AME DOWN AND TOOK THE
        {SPACE}"
DD 4040 DATA"YOU CAN NOT GO TH
        AT WAY."
RR 4045 DATA3,128,,7,192,,3,12
        8,,1,,,15,224,,31,240,
        ,23,208,,19,144,,23,20
        8,
XR 4050 DATA23,208,,6,192,,6,1
        92,,6,192,,6,192,,6,19
        2,,14,224,
AS 4055 DATA4,18,19,49,40,29
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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 2: Vampyre Hunter—Machine Language Portion

See instructions in article on page 42 before beginning to type.

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C000:12 C0 85 C5 60 C9 00 07 F8
C008:CF C0 0D C2 41 C2 47 C2 D5
C010:6F C3 A9 35 8D 26 03 A9 77
C018:C4 8D 27 03 A9 00 85 FB C8
C020:85 FE A0 00 98 8D 95 CA 29
C028:8D B5 CA 8D D5 CA 8D EE F3
C030:CA B9 95 CA 18 69 40 99 65
C038:96 CA B9 B5 CA 69 00 99 DF
C040:B6 CA C8 C0 1F D0 EA B9 C0
C048:D5 CA 18 69 28 99 D6 CA 21
C050:B9 EE CA 69 00 99 EF CA 6B
C058:C8 C0 18 D0 EA A9 C5 8D 95
C060:12 03 A9 0B 8D 11 03 A9 F1
C068:CC 8D 88 02 A9 93 20 CA 8B
C070:F1 A9 3F 8D 02 DD A9 14 05
C078:8D 00 DD A9 3E 8D 18 D0 40
C080:85 02 A9 00 8D 0E DC A9 82
C088:33 85 01 A2 00 86 03 86 F5
C090:05 A9 D8 85 04 A9 F8 85 B0
C098:06 A0 00 B1 03 91 05 C8 91
C0A0:D0 F9 E6 06 E6 04 E8 E0 40
C0A8:08 D0 EE A9 37 85 01 A9 56
C0B0:01 8D 0E DC A9 FF 8D 0F 1D
C0B8:D4 A9 80 8D 18 D4 A9 81 E0
C0C0:8D 12 D4 A0 A0 B9 75 C9 D2
C0C8:99 37 FB 88 D0 F7 60 A9 BD
C0D0:A0 85 04 A9 00 85 03 A8 E3
C0D8:A9 20 91 03 88 D0 FB E6 FF
C0E0:04 A6 04 E0 C0 D0 F3 A9 77
C0E8:03 8D 36 03 A9 00 8D 3D EB
C0F0:03 8D 3E 03 A9 3F 8D 3B EF
C0F8:03 A9 1F 8D 3C 03 20 A5 F6
C100:C6 A9 00 8D 3F 03 A9 0F 92
C108:85 FC A9 00 8D 3E 03 A9 D7
C110:1C 8D 3D 03 A9 24 8D 3B 11
C118:03 A9 1F 8D 3C 03 20 A5 18
C120:C6 20 5B C6 C6 FC 10 F9 2B
C128:CE 36 03 10 BF A9 03 8D 3A
C130:36 03 A9 01 AA A8 A9 66 86
C138:20 B6 C8 A2 3E A0 01 A9 DC
C140:66 20 B6 C8 CE 36 03 10 C7
C148:E9 A9 03 8D 36 03 20 B6 19
C150:C7 EE 20 D0 CE 36 03 10 E9
C158:F5 A9 03 8D 36 03 A9 01 8C
C160:8D 3A 03 20 22 C9 A9 1E 45
C168:8D 3A 03 20 22 C9 A9 02 31
C170:8D 36 03 A9 07 85 FC 20 AB
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C178:F2 C1 EE 36 03 20 DA C5 3B
C180:CE 36 03 20 13 C9 C9 20 CE
C188:D0 ED A9 14 91 03 C6 FC 89
C190:D0 E5 CE 36 03 10 DC A9 EE
C198:03 85 FC A9 03 8D 36 03 F6
C1A0:20 F2 C1 20 DA C5 20 13 6C
C1A8:C9 C9 20 D0 EE CE 36 03 B6
C1B0:10 F1 A9 03 8D 36 03 20 89
C1B8:DA C5 A9 13 A0 00 91 03 AC
C1C0:CE 36 03 10 F2 C6 FC D0 18
C1C8:D2 AD 1B D4 29 03 C9 03 BD
C1D0:F0 F7 8D 36 03 20 F2 C1 20
C1D8:A9 03 91 03 20 F2 C1 AD 52
C1E0:39 03 8D 47 CB AD 3A 03 74
C1E8:8D 88 CB AD 36 03 8D 40 C2
C1F0:05 60 AD 1B D4 29 3F 8D CD
C1F8:39 03 AD 1B D4 29 1F 8D 58
C200:3A 03 20 DA C5 20 13 C9 B3
C208:C9 20 D0 E6 60 A2 3F AD BC
C210:1B D4 29 03 9D 00 05 8D 32
C218:36 03 AD 1B D4 29 01 9D CB
C220:00 04 20 F2 C1 AD 39 03 14
C228:9D 07 CB AD 3A 03 9D 48 F3
C230:CB BC 00 04 B9 3F C2 A0 FB
C238:00 91 03 CA 10 D1 60 12 C9
C240:02 A9 01 85 FD D0 04 A9 8E
C248:00 85 FD A9 3F 85 FC A6 3A
C250:FC BD 00 04 C5 FD F0 03 0F
C258:4C 17 C3 BD 07 CB 8D 39 D9
C260:03 BD 48 CB 8D 3A 03 BD B5
C268:00 05 8D 36 03 20 DA C5 58
C270:20 13 C9 48 A9 20 91 03 7C
C278:68 D0 0A A6 FC A9 FF 9D 3E
C280:07 CB 4C 17 C3 20 1F C3 18
C288:B0 6D C9 20 D0 23 A6 FC 5A
C290:AD 39 03 9D 07 CB AD 3A 72
C298:03 9D 48 CB AD 36 03 9D B6
C2A0:00 05 20 DA C5 A6 FD BD 9B
C2A8:3F C2 A0 00 91 03 4C 17 DA
C2B0:C3 C9 13 D0 2C AD 36 03 81
C2B8:F0 19 C9 03 F0 07 AD 1B 80
C2C0:D4 29 01 D0 0E CE 36 03 43
C2C8:20 1F C3 B0 2A C9 20 D0 33
C2D0:26 F0 BB EE 36 03 20 1F 29
C2D8:C3 B0 1C C9 20 D0 18 F0 F1
C2E0:AD A6 FC BD 00 04 D0 0F 23
C2E8:EE 36 03 20 DA C5 20 13 17
C2F0:C9 C9 20 D0 02 F0 97 A6 88
C2F8:FC BD 07 CB 8D 39 03 BD 1F
C300:48 CB 8D 3A 03 BD 00 05 03
C308:8D 36 03 20 DA C5 A6 FD 7F
C310:BD 3F C2 A0 00 91 03 C6 BB
C318:FC 30 03 4C 4F C2 60 A9 3F
C320:00 A0 03 99 00 07 88 10 07
C328:FA A0 03 B9 00 07 F0 05 54
C330:88 10 F8 38 60 AD 1B D4 67
C338:29 03 A8 B9 00 07 D0 F5 79
C340:A9 01 99 00 07 A6 FC BD 9A
C348:07 CB 18 79 7D CA 8D 39 4C
C350:03 BD 48 CB 18 79 79 CA F2
C358:8D 3A 03 20 DA C5 20 13 D8
C360:C9 C9 20 F0 08 C9 13 F0 D0
C368:04 C9 14 D0 BC 18 60 AD A8
C370:FC 03 D0 03 4C 09 C4 A0 32
C378:1F B9 59 CA 99 D8 FB 88 86
C380:10 F7 AD 47 CB 8D 39 03 42
C388:AD 88 CB 8D 3A 03 AD 40 D4
C390:05 8D 36 03 20 DA C5 A0 8D
C398:00 A9 20 91 03 A9 40 85 6C
C3A0:FC 20 1F C3 B0 47 C9 14 19
C3A8:F0 43 C9 13 D0 2A AD 36 A4
C3B0:03 F0 19 C9 03 F0 07 AD 4D
C3B8:1B D4 29 01 D0 0E CE 36 CA
C3C0:03 20 1F C3 B0 27 C9 20 C7
C3C8:D0 23 F0 0C EE 36 03 20 D6
C3D0:1F C3 B0 19 C9 20 D0 15 06
C3D8:AD 36 03 8D 40 05 AD 39 A8
C3E0:03 8D 47 CB AD 3A 03 8D DC
C3E8:88 CB 4C FF C3 AD 47 CB 60
C3F0:8D 39 03 AD 88 CB 8D 3A 91
C3F8:03 AD 40 05 8D 36 03 20 31
C400:DA C5 A0 00 A9 16 91 03 48
C408:60 AD 40 05 8D 36 03 AD 7E
C410:47 CB 8D 39 03 AD 88 CB 21
C418:8D 3A 03 20 DA C5 20 13 9A
C420:C9 C9 16 D0 04 A9 20 91 69
C428:03 A0 1F B9 39 CA 99 D8 DB
C430:FB 88 10 F7 60 86 03 A6 25
C438:9A E0 03 F0 05 A6 03 4C CB
C440:CA F1 A6 03 C9 0F D0 06 E2
C448:A9 04 8D 88 02 00 C9 02 87
C450:D0 05 85 02 4C CA F1 C9 8F
C458:06 D0 09 48 A9 00 85 02 19
C460:68 4C CA F1 86 03 A6 02 39
C468:08 A6 03 28 F0 CF C9 0D E9
C470:D0 12 A5 D3 18 65 FB C9 F0
C478:28 90 03 20 C7 C4 20 A4 D2
C480:C4 4C C7 C4 C9 20 F0 10 85
C488:86 03 A6 FB 9D 00 07 E6 8C
C490:FB A6 03 A9 01 4C CA F1 7D
C498:A5 D3 18 65 FB C9 27 90 29
C4A0:03 20 C7 C4 8A 48 A2 00 B3
C4A8:86 FC E4 FB F0 12 BD 00 5C
C4B0:07 20 CA F1 E6 FC A6 FC B3
C4B8:E4 FB D0 F2 A9 00 85 FB 51
C4C0:68 AA A9 1D 4C CA F1 E6 88
C4C8:FE A5 FE C9 15 F0 05 A9 D7
C4D0:0D 4C CA F1 8A 48 A9 00 35
C4D8:85 FE A2 00 BD C0 CF 48 12
C4E0:BD 8D CA 9D C0 CF AD 86 07
C4E8:02 9D C0 DB E8 E0 08 D0 5C
C4F0:EB A9 00 85 C6 A5 C6 F0 7E
C4F8:FC A9 00 85 C6 A2 07 68 FA
C500:9D C0 CF CA 10 F9 68 AA 15
C508:4C CF C4 A9 00 85 03 85 82
C510:FE A2 00 BD 89 CA 20 CA 22
C518:F1 E8 E0 04 D0 F5 20 E4 B6
C520:FF C9 0D D0 1E A9 20 20 C4
C528:CA F1 A9 0D 20 CA F1 A6 52
C530:03 F0 09 BD FF 06 C9 20 42
C538:D0 02 C6 03 A9 00 A4 03 4F
C540:4C 91 B3 C9 14 D0 0C A6 0C
C548:03 F0 D3 C6 03 20 CA F1 98
C550:4C 1E C5 C9 20 D0 0D A6 E3
C558:03 F0 C3 BD FF 06 C9 20 C1
C560:F0 BC A9 20 C9 20 90 B6 71
C568:C9 22 F0 B2 C9 2C F0 AE 3A
C570:C9 60 B0 AA A6 03 E0 3C F8
C578:F0 A4 9D 00 07 E6 03 20 53
C580:CA F1 4C 11 C5 AD 35 03 DA
C588:38 E9 04 8D 3A 03 A9 00 35
C590:8D 38 03 AD 34 03 38 E9 34
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C680:AD 1B D4 CD 3F 03 B0 F8 83
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C810:20 13 C9 C9 20 F0 0F C9 F8
C818:1F D0 E9 A0 02 20 15 C9 39
C820:C9 20 F0 0B D0 DE A0 02 B2
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CA40:7F 7F 3F 0F 3F FF 00 00 48
CA48:00 00 00 00 00 FE 08 FF E9
CA50:FE FE FC F0 FC FF 00 00 BB
CA58:00 00 7F 7F 7F 7F 10 FF EF
CA60:7F 7F 3F 0F 3F FF 00 00 68
CA68:00 00 FE FE FE FE 08 FF D1
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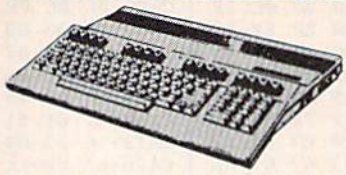

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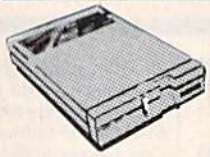

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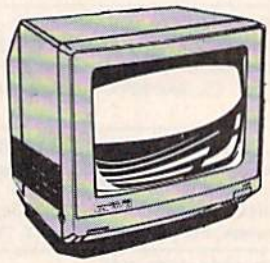

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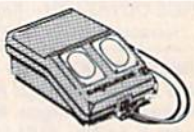

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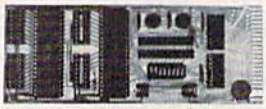

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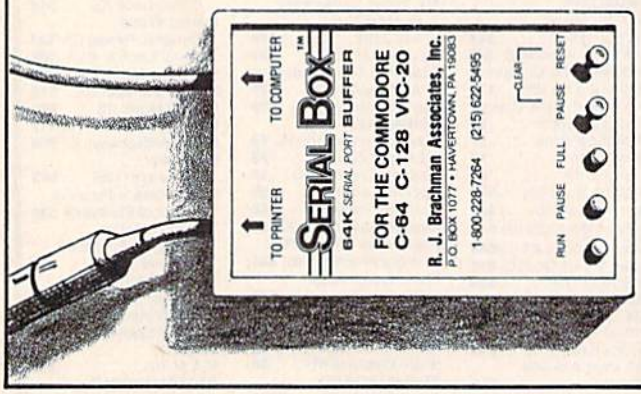

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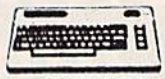

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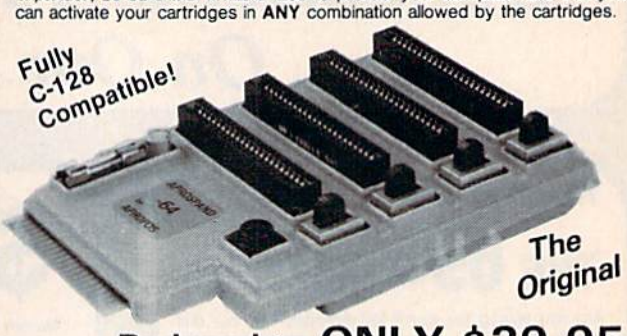

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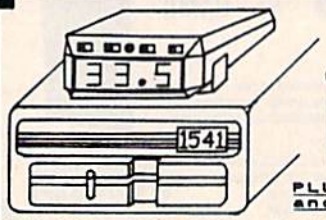

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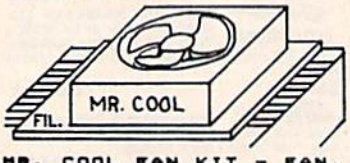

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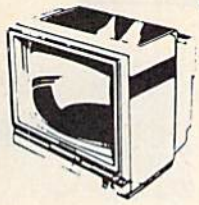

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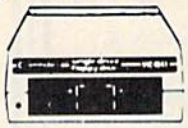

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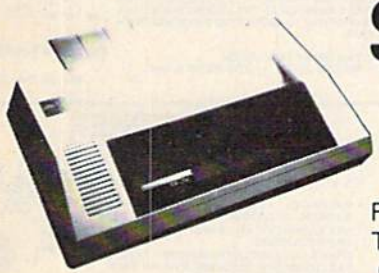

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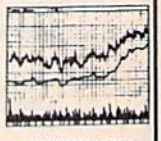

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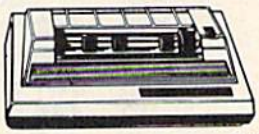

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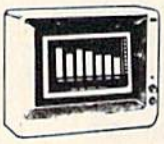

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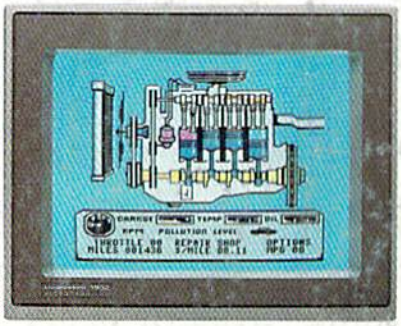
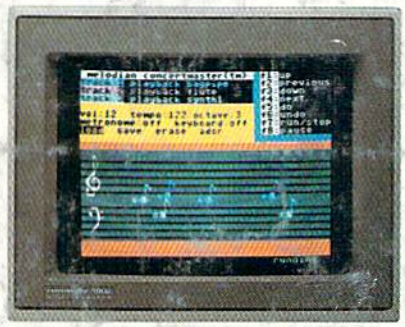


fix an engine

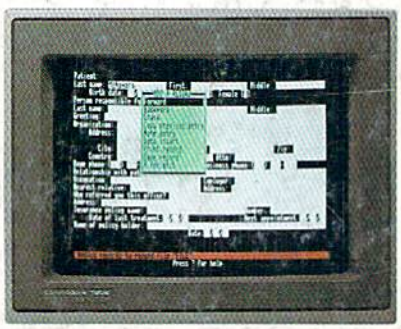


compose a song

paint a picture

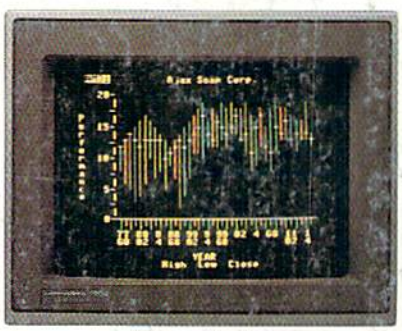
our banking

learn to fly



organize a data base

tell a story



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